SUPPLEMENTAL CMS REPORT
CLOSED FORMER WOOD TREATING UNITS

INTERNATIONAL PAPER COMPANY

1633 SOUTH 1ST STREET
WIGGINS, MS 39577
EPA HSWA PERMIT NO. HW-980-600-084

PREPARED FOR:

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PROJECT NO. 02.20020008.15

August 2015

Certification:

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Prepared For:

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EarthCon Consultants, Inc. is submitting this Supplemental CMS Report for the former International Paper- Wood Treating Site located at 1633 South 1st Street in Wiggins, MS. This Report was prepared by or performed under the direction of the State of Mississippi Registered Professionals listed below. If you have any questions or comments concerning the report, please contact the undersigned at (901) 755-5404, or nkennel@earthcon.com.

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1.0 INTRODUCTION

On behalf of International Paper Company (IP), EarthCon Consultants, Inc. (EarthCon) has prepared this Supplemental Corrective Measures Study (Supplemental CMS) Report for additional evaluation of two RCRA Corrective Action units at the International Paper (IP) Closed Former Wood Treating Units in Wiggins, MS (the Site). The units are Solid Waste Management Unit (SWMU) 37 Drainage Ditches and Area of Concern (AOC) B Church House Branch, see **Figure 1. Site Location Map,** and **Figure 2. Corrective Action Units**. The Site is regulated under the EPA Permit No. 980-600-348 (EPA HSWA Permit) issued under the Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA).

The evaluation activities (i.e., sampling locations, number and type of samples collected, and laboratory analyses) were conducted in accordance with the Supplemental CMS Field Sampling Plan (Work Plan) (**Appendix A**) submitted to U.S. Environmental Protection Agency Region 4 (EPA) on May 21, 2015, and accepted by EPA on June 1, 2015. This report presents the analytical results with an updated screening level ecological risk assessment based on draft ecological risk screening levels/values provided by EPA that are incorporated in the Work Plan.

The updated screening level ecological risk assessment results in this report are submitted in support of the finalization of the Corrective Measures Study (CMS) for the Site and for reaching a decision on a final remedy for these units in conjunction with the EPA HSWA Permit renewal planned by EPA.

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2.0 PROJECT BACKGROUND

The project background and recent activities for this Site under RCRA Corrective Action are summarized briefly below.

2.1 RCRA Facility Investigation (RFI)

The RCRA Facility Investigation (RFI) for this Site was conducted in February 2001 in accordance with a RFI Work Plan prepared by IP in August 1999 (Exponent, 1999). The RFI results were reported to EPA in 2002 (Premier, 2002). The purpose of the RFI was to investigate the potential releases of site-related chemicals in soil, sediment, and surface water, characterize the nature and extent of such releases, and identify actual or potential receptors that might be exposed to site-related chemicals. Groundwater was not addressed in the RFI process with EPA because this environmental media is being addressed on a site-wide basis under a parallel Hazardous Waste Permit No. 980-600-084 with the Mississippi Department of Environmental Quality (MDEQ HW Permit). Detailed results of the RFI were presented in the RFI Report.

2.2 Preliminary Corrective Measures Study (PCMS)

The RFI results were used by IP to prepare a Preliminary Corrective Measures Study (PCMS) the results of which were reported to EPA in 2005 (Premier, 2005). The PCMS was conducted in accordance with a CMS Work Plan prepared by IP in June 2004 (Premier, 2004) that was approved by EPA. The PCMS was conducted to develop corrective measures for SWMU 37 and AOC B, as well as to address RFI data gaps identified by EPA during their review of the RFI Report.

IP submitted a separate Dioxin Soil Sampling Report to EPA in 2008 that included analytical results for additional shallow soil samples collected from the SWMU 37 Drainage Ditches that were analyzed for Dioxin (Premier, 2008).

EPA reviewed the PCMS and provided review comments to IP in July 2014 (EPA, July 2014) and September 2014 (TechLaw, September 2012). EPA, IP and EarthCon met at the Site on July 22,

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2014 to discuss EPA's review comments. As a result of this discussion, EPA requested that IP collect and analyze additional soil, sediment and surface water samples from SWMU 37 and AOC B, and update the ecological risk screening to bring the PCMS conclusions up-to-date. EPA, IP and EarthCon conducted a Site Visit on April 30, 2015 to discuss the specifics of the additional field activities. Based upon site visit discussions, it was agreed that additional dioxin sampling was not needed.

A Supplemental CMS Field Sampling Plan was prepared by IP in accordance with the scoping decisions reached at the Site Visit with EPA on April 30, 2015. The sample collection, analysis and environmental risk screening methods were defined in the Field Sampling Plan submitted to EPA on May 21, 2015, which was accepted by EPA on June 1, 2015 (EarthCon, 2015). The Supplemental CMS Field Sampling Plan was implemented by EarthCon on June 8 – 9, 2015. The sampling and analytical results and updated ecological risk screening results are included in this report.

2.3 Corrective Action Permits

IP is regulated by EPA under EPA HSWA Permit No. 980-600-084 (EPA HSWA Permit), and under a parallel permit with the same number by MDEQ Hazardous Waste Permit No. 980-600-084 (MDEQ HW Permit). The results included in this report are submitted in support of the EPA HSWA Permit.

The EPA HSWA Permit was issued to IP in 1983, with a 10-year renewal in 1993. The 10-year renewal in 2003 was suspended by EPA (EPA, 2003). The next renewal is currently planned for the end of 2015.

The parallel MDEQ HW Permit was issued to IP in July 1998 to address the site-wide groundwater corrective action. The MDEQ HW Permit was most recently renewed on May 4, 2010 with groundwater corrective actions still in progress. The next MDEQ HW Permit renewal is due on a 10-year cycle on April 30, 2020. The requirements of and the activities being conducted by IP under the MDEQ HW Permit are not a subject of this report.

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3.0 SCOPE AND OBJECTIVES

The specific objectives and scope of work for the Supplemental CMS were contained in the Supplemental CMS Field Sampling Plan (EarthCon, 2015) and are summarized briefly below.

3.1 Overall Objectives

The overall objective of the Supplemental CMS was to collect sufficient data to update the screening level ecological risk evaluation for shallow sediment and surface water at AOC B Church House Branch and shallow soil at SMWU 37 Drainage Ditches. The updated evaluations are needed to support the finalization of the CMS and to reach a decision on a final remedy for these two units in conjunction with the HSWA permit renewal planned by EPA.

3.2 Scope of Work

Sample Collection

Shallow soil samples were collected from the SWMU 37 Drainage Ditches at locations consistent with prior sampling conducted in 2005 (**Ditches 1, 2 and 3**), as well as at one additional drainage ditch location (**Ditch 4**) requested by EPA. Sediment and surface water samples were collected from various points in the Church House Branch as defined in the Supplemental CMS Field Sampling Plan (**Appendix A**). The sample locations are shown on **Figure 3. Sampling Locations** and the sample collection details are summarized below and in **Tables 1, 2,** and **3** for soil, sediment and surface water, respectively. Photographic documentation of field sampling is provided in **Appendix B**. In some cases, sample locations are intended to approximate prior sampling locations from the 2005 PCMS sampling, however, additional locations were included as requested by EPA due to their location with respect to the various Drainage Ditch entry points into the Church House Branch channel.

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Soil Samples

Soil samples were collected from depths of 0 – 0.5 feet from the soil surface. Soil samples were collected using a stainless steel (SS) trowel. The collected samples were mixed in a stainless steel (SS) bowl to facilitate collection of a sample representative of the full 0 – 0.5 foot sample depth. Soil samples were collected in the following order: **Soil 5, Soil 4, Soil 2, Soil 3,** and **Soil 1**.

Sediment Samples

Sediment samples were collected in the Church House Branch from depths of 0 – 0.5 feet from the top of the sediment interface. Sediment samples were collected using methods appropriate for the water depth at each point. The sediment encountered was largely sand and was not well suited to collection using a coring device. Therefore, the samples were collected using a SS trowel or a shovel. The collected samples were mixed in a SS bowl to facilitate collection of a sample representative of the full 0–0.5 foot sample depth. Sediment samples were collected the day after surface water samples were collected, in the following order: **SD-11, SD-10, SD-9, SD-8, SD-7, SD-6, SD-5, SD-4, SD-3, SD-2,** and **SD-1**.

Surface Water Samples

Surface water samples were collected using a “Clean Hands/Dirty Hands” approach. The person handling the sample bottle before, during and immediately after sample collection was the “Clean Hands” sampler and wore nitrile gloves and avoided touching or handling other equipment or materials while sampling. The “Clean Hands” sampler submerged the sample bottle in the top 0 – 1 feet of standing water at each sampling point for sample collection. The sample bottle was filled and drained twice before retaining the third sample, thus rinsing the bottle interior with sample. The “Dirty Hands” sampler handled sampling equipment and the sample cooler. A third team member recorded notes in the field notebook and took photographs. The surface water samples were all collected on June 8, 2015, prior to the collection of sediment or soil samples. Surface water sampling started at the furthest downstream location then sequentially moving upstream, in the following order: **SW-5, SW-4, SW-3, SW-2,** and **SW-1**.

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All Samples

All samples were collected in laboratory-cleaned containers and placed on ice immediately after sample collection. Sample bottles were labeled and packed in bubble-wrap and ice in coolers for overnight shipment to the analytical laboratory, ALS Environmental (ALS) in Jacksonville, FL. A chain-of-custody sheet accompanied each cooler when shipped. Copies of Chain-of-Custody sheets are provided in **Appendix C**. Sampling equipment (i.e., SS trowel, shovel, SS mixing bowl, etc.) was cleaned and decontaminated between sample locations using Alconox, tap water, isopropanol, 0.1 Normal nitric acid, and distilled water rinses. Decontamination solvents were applied to sample equipment by immersion in plastic tubs. Spent decontamination fluids and excess sample were placed on or allowed to drain to the ground surface.

Pertinent field sampling information was documented in a field logbook and on the sample bottle label. Sample locations were marked in the field with wooden stakes and fluorescent survey tape. Survey tape was also placed on a nearby tree trunk, branch or bush. Survey tape was also used to mark the path by which the sampling crew accessed particular sample locations. A portable GPS unit was used to collect latitude and longitude data for each location. The latitude and longitude data are included in **Tables 1, 2** and **3**.

Sample Analysis

As described in the Supplemental CMS Field Sampling Plan, the collected samples were analyzed for parameters related to the wood treatment chemicals associated with the Closed Former Wood Treating Units as well as the ongoing wood treatment at the Baldwin Pole Mississippi LLC facility. The analytical methods are listed in **Table 5** of **Appendix A** and include Pentachlorophenol, eighteen select Polycyclic Aromatic Hydrocarbons (PAHs), three select metals including Arsenic (As), Copper (Cu) Chromium (Cr), and Hardness (surface water only), Total Organic Carbon (soil and sediment), and Grain Size (soil and sediment). Sample analysis was conducted by ALS in Jacksonville, FL under subcontract to EarthCon. ALS has been the laboratory subcontractor for prior sample analysis at this Site for many years. The target analytical detection limits are listed on **Table 6** of **Appendix A**.

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QA/QC

One field duplicate, one equipment blank, and one MS/MSD sample were collected for each of the three sample media: surface water, sediment, and soil. The field duplicate samples were submitted blind to the laboratory. The analytical results for the field samples and QA/QC samples were validated by an EarthCon Senior Chemist. The validation included a review of sample preservation, holding times, duplicate precision, blank concentrations, and spike recoveries. The validation results, including the addition of qualifier flags to the analytical results are summarized in Data Validation Memos that are included in **Appendix D**. Analytical laboratory data sheets marked with the data qualifier flags are included as **Appendix E**. Weather conditions/issues, and/or changes in site conditions, sample locations, or sampling methods were noted in the field log book.

Ecological Risk Screening

EPA provided IP with a set of draft ecological screening values/levels for comparison to the validated analytical results. These values/levels for the analytical parameters selected for this event are listed in **Appendix A** in **Tables 1a, 1b** and **1c** for surface water, **Tables 2a, 2b** and **2c** for sediment and **Table 3** for soil. The draft ecological screening levels and values for the analytes in this report have been included on the analytical results **Tables 4, 5, 6,** and **7** for data comparison purposes.

Exceptions to the Work Plan

The Supplemental CMS Field Sampling Plan stated that 0.1 Normal nitric acid (HNO3) would be used as part of the sampling equipment decontamination procedure during soil and sediment sample collection activities. Due to a delayed equipment shipment to the Site, the sampling team did not have sufficient HNO3 for use between locations during the sampling event.

The Supplemental CMS Field Sampling Plan stated that due to the site conditions and limited access to the sample locations, decontamination solvents would be applied to the sampling equipment with spray bottles carried to the sampling locations instead of by immersion in plastic tubs. However, spray bottles proved cumbersome to carry so equipment immersion in plastic tubs at the staging area was used instead.

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4.0 ANALYTICAL RESULTS

The analytical results for the collected soil, sediment and surface water samples are summarized below. Photographs of the sampling locations are included in **Appendix B**. Copies of Chain-of-Custody Sheets are included in **Appendix C**. The QA/QC findings for soil, sediment and surface water analyses are described in detail in **Appendix D**. Analytical Laboratory Data Sheets are included in **Appendix E**.

4.1 Soil (SWMU37)

EarthCon collected five soil samples, one Matrix Spike (MS), one Matrix Spike Duplicate (MSD), two grain size analysis samples, and one duplicate soil sample at the SWMU 37 Drainage Ditches on June 9, 2015. **Table 1** provides detailed soil sample information and soil sample locations are shown on **Figure 3**. The samples were analyzed for the following parameters:

- Pentachlorophenol (PCP);
- Select Polycyclic Aromatic Hydrocarbons (PAHs);
- Select metals: Arsenic, Chromium, and Copper and,
- General chemical and physical parameters:
    - Total Organic Carbon (TOC); and,
    - Grain Size.

The laboratory analytical results for the June 2015 soil sampling event were compared against the corresponding Draft ecological screening values in the Supplemental CMS Field Sampling Plan in **Appendix A**. The analytical results are described below, and summarized in **Table 4**. The locations of the detected analytical compounds are shown on **Figure 4**.

4.1.1 Pentachlorophenol (PCP)

PCP was detected in all five of the soil samples at concentrations ranging from 73.8 micrograms per kilogram (ug/Kg) to 2,020 ug/Kg. Concentrations of PCP in all soil samples were below the draft ecological screening value of 2,100 ug/Kg.

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4.1.2 Polycyclic Aromatic Hydrocarbons (PAHs)

Low Molecular Weight PAHs

Low molecular weight (LMW) PAHs were detected in four of the five soil samples. Anthracene was detected in four of the samples, Acenaphthylene was detected in two of the samples, and Fluorene was detected in one sample. No LMW PAHs were detected in soil sample **Soil 3**. The sum of LMW PAHs in each individual soil sample did not exceed the draft ecological screening level for total LMW PAHs.

High Molecular Weight PAHs

All five of the soil samples contained at least three (3) high molecular weight (HMW) PAHs. Benzo(b)fluoranthene, Fluoranthene and Pyrene were detected in all five soil samples, Chrysene was detected in four of the soil samples, and Benzo(a)pyrene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene and Indeno(1,2,3-cd)pyrene were detected in soil samples **Soil 1** and **Soil 5**. The sum of HMW PAHs in each individual soil sample did not exceed the draft ecological screening level for total HMW PAHs.

4.1.3 Metals

Soil samples were analyzed for select metals Arsenic, Chromium and Copper. All five of the soil samples contained detections for each of these metals. Detected concentrations were below the respective draft ecological soil screening levels with the exception of:

- **Soil 1** – Copper – 36.1 milligrams per kilogram (mg/Kg); draft ecological screening level of 28 mg/Kg; and
- **Soil 4** – Chromium – 36.9 mg/Kg; draft ecological screening level of 28 mg/Kg.

4.1.4 Total Organic Carbon (TOC)

The TOC analysis results for the five soil samples ranged from 760 mg/Kg (**Soil 3**) to an estimated concentration of 16,000 mg/Kg (**Soil 2**). There is no ecological screening level for TOC in soil. However, the TOC results are used as a general characterization of the soil matrix in the drainage ditches.

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4.1.5 Grain Size Analysis

Grain size samples were collected from soil locations **Soil 5** and **Soil 1**. Grain size analytical results are not tabulated in this report but are provided in **Appendix E**. The grain size analytical results are generally consistent with the soil classifications included in the sample descriptions in **Table 1**.

4.1.6 Quality Analysis/Quality Control (QA/QC

Quality Assurance/Quality Control (QA/QC) procedures implemented during soil sampling include collection and analysis of various samples as a check on sample collection, packing and transport procedures and analytical laboratory precision. Specific QA/QC samples collected during soil sampling included a field duplicate, matrix spike/matrix spike duplicate and equipment blank. The QA/QC results are summarized in the Data Validation Memos prepared by EarthCon's Senior Chemist and are included in **Appendix D**. Data qualification flags assigned as a result of the data validation are included in the analytical results **Table 4**, and on the analytical laboratory data sheets in **Appendix E**. Based on the data validation, the analytical results were determined to be usable for the purposes of this investigation.

Duplicate Sample

Sample collection and laboratory analysis precision was evaluated by the collection and analysis of one blind duplicate soil sample. Soil sample **Soil 6** was the duplicate sample collected from soil sample location **Soil 1**. The duplicate sample was collected at the same time, stored in the same manner, and analyzed for the same parameters as the original sample.

Matrix Spike/Matrix Spike Duplicate

The MS/MSD are separate samples collected at the same time, stored in the same manner, and analyzed for the same parameters as the original sample. However the MS/MSD samples are spiked in the laboratory with known concentrations of the parameters being analyzed to determine if the laboratory extraction and analysis procedures are working within the established control limits. Samples **Soil-MS** and **Soil-MSD** were collected from location **Soil 2**.

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Equipment Blank Sample

One equipment blank, **Soil-EB,** was collected during the soil sampling activities in this assessment. The equipment blank was collected after the field-decontamination of a set of sampling equipment (SS trowel, bowl and sample scoop). Decontamination consisted of sequentially immersing the sampling equipment in plastic tubs of decontamination solvents, scrubbing them with a brush and/or paper towels per the procedures in the Supplemental CMS Field Sampling Plan. The equipment blank was collected by pouring an appropriate volume of distilled water over the field-decontaminated soil sampling equipment into the appropriate sample bottles.

4.2 Sediment (AOC B)

On June 9, 2015, EarthCon collected eleven sediment samples, one MS, one MSD, two grain size analysis samples, and one duplicate sediment sample from AOC B. **Table 2** provides detailed sediment sample information and location data. Sediment sample locations are shown on **Figure 3**. The samples were submitted for the following laboratory analyses:

- PCP;
- Select PAHs;
- Select metals: Arsenic, Chromium, and Copper; and,
- General chemical and physical parameters including:
    - TOC; and,
    - Grain Size Analysis.

The laboratory analytical results for the June 2015 sediment sampling event are described below, and summarized in **Tables 5** and **6**. **Table 5** provides the analytical results with the comparison of reported concentrations to draft ecological screening levels for non-narcotic and narcosis effects. **Table 6** provides the organic carbon normalized analytical results for PAHs with the draft ecological screening levels for narcosis effects. **Figure 5** shows the detected sediment concentrations and **Figure 6** shows the Equilibrium Screening Benchmark Toxic Units (ESBTU) results for the organic carbon normalized PAH results for each sample location.

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4.2.1 Pentachlorophenol (PCP)

PCP was detected in 10 of the 11 sediment samples. One sediment sample, **SD-7**, was non-detect, and eight of the sediment samples were at concentrations below the corresponding draft acute and chronic ecological screening levels for non-narcotic effects. Two sediment samples were above the draft chronic ecological screening level of 744 ug/Kg and the draft acute ecological screening level of 1,200 ug/Kg are:

- **SD-3** – 1,680 ug/Kg; and,
- **SD-5** – 1,950 ug/Kg.

4.2.2 Polycyclic Aromatic Hydrocarbons (PAHs)

PAH concentrations in sediment samples were directly compared to the draft ecological screening levels for narcosis effects. Organic carbon normalized PAH concentrations in sediment samples were also compared to the corresponding draft ecological screening levels for narcosis effects. Three of the sediment samples; **SD-7**, **SD-8**, and **SD-9** were non-detect for PAHs. The screening results for the other samples with detected concentrations of PAHs are provided below:

Direct Sediment Concentrations

Three of the sediment samples, **SD-1**, **SD-4** and **SD-10,** each had concentrations of PAHs that were below the draft ecological screening values for narcosis effects. Five sediment samples had concentrations that were above the screening value for Anthracene and one sediment sample was above the screening level for Fluoranthene. The sediment samples and PAH compounds that had direct concentrations that were above the draft ecological screening values for narcosis effects include:

- **SD-2** – Anthracene – 185 ug/Kg (screening value – 3.3 ug/Kg) and
  Fluoranthene – 895 ug/Kg (screening value – 241 ug/Kg);
- **SD-3** – Anthracene – 131 ug/Kg;
- **SD-5** – Anthracene – 66.8 ug/Kg;
- **SD-6** – Anthracene – 4.29 ug/Kg; and,
- **SD-11** – Anthracene – 21.1 ug/Kg.

The comparison to draft ecological screening levels is discussed in greater detail in **Section 5.0 Ecological Screening Results**.

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Organic Carbon Normalized Sediment Concentrations

Organic carbon normalized concentrations for five of the sediment samples, **SD-2, SD-4, SD-6, SD-7,** and **SD-8**, exceeded one or more of the narcosis screening Equilibrium Sediment Benchmark Toxic Units (ESBTU), ESBTU*11.5, or ESBTU*1.64 thresholds of 1. The ESBTU results are shown on **Figure 6** and are discussed in greater detail in **Section 5.0 Ecological Screening Results**.

4.2.3 Metals

Sediment samples were analyzed for select metals Arsenic, Chromium and Copper. All eleven of the sediment samples contained detections for one or more of these metals. Arsenic concentrations ranged from non-detect in sediment sample **SD-7** to 18.8 mg/Kg in sediment sample **SD-5**. Chromium concentrations ranged from 1.25 mg/Kg in sediment sample **SD-7** to 56.9 mg/Kg in sediment sample **SD-5**. Copper concentrations ranged from non-detect in sediment sample **SD-7** to 42.9 mg/Kg in sediment sample **SD-3**. Metals concentrations in sediment samples **SD-3** and **SD-5** were above the Chronic Non-Narcotic screening values.

- **SD-3**:
  - Arsenic – 13.5 mg/Kg (Chronic screening value 9.8 mg/Kg);
  - Chromium – 56.2 mg/Kg (Chronic screening value 43.4 mg/Kg); and
  - Copper – 42.9 mg/Kg (Chronic screening value 31.6 mg/Kg).

- **SD-5**:
  - Arsenic – 18.8 mg/Kg;
  - Chromium – 56.9 mg/Kg; and
  - Copper – 33.2 mg/Kg.

4.2.4 Total Organic Carbon (TOC)

The TOC analysis results for the eleven sediment samples ranged from non-detect at 110 mg/Kg (**SD-7**) to an estimated concentration of 63,000 mg/Kg (**SD-12**, the field duplicate of **SD-11**). There is no ecological screening level for TOC; however, TOC is used to calculate organic carbon normalized concentrations for the sediment samples. The TOC analytical results are listed on **Tables 5** and **6**.

4.2.5 Grain Size Analysis

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Grain size samples were collected from sediment locations **SD-6** and **SD-11**. Grain size analytical results are not tabulated in this report but are provided in **Appendix E**. The grain size analytical results are generally consistent with the classifications included in the sediment sample descriptions in **Table 2**.

4.2.6 Quality Analysis/Quality Control (QA/QC)

Quality Assurance/Quality Control (QA/QC) procedures implemented during sediment sampling include collection and analysis of various samples as a check on sample collection, packing and transport procedures and analytical laboratory precision. Specific QA/QC samples collected during sediment sampling included a field duplicate, matrix spike/matrix spike duplicate, and equipment blank. The QA/QC results are summarized in the Data Validation Memos prepared by EarthCon's Senior Chemist and is included in **Appendix D**. Data qualification flags assigned as a result of the data validation are included in the analytical results **Tables 5** and **6**, and on the analytical laboratory data sheets in **Appendix E**. Based on the data validation, the analytical results were determined to be usable for the purposes of this investigation.

Duplicate Sample

Sample collection and laboratory analysis precision was evaluated by the collection and analysis of one blind duplicate sediment sample. Sediment sample SD-12 was the duplicate sample collected from sediment location SD-11. The duplicate sample was collected at the same time, stored in the same manner, and analyzed for the same parameters as the original sample.

Matrix Spike/Matrix Spike Duplicate

The MS/MSD are separate samples collected at the same time, stored in the same manner, and analyzed for the same parameters as the original sample; however these samples are spiked (in the laboratory) with known concentrations of the contaminants being analyzed to determine if the laboratory extraction and analysis procedures are working within the established control limits. **SD-5** was the location where samples **SD-MS** and **SD-MSD** were collected.

Equipment Blank Sample

One equipment blank, **SD-EB**, was collected during the sediment sampling activities in this

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assessment. The equipment blank was collected after the field-decontamination of a set of sampling equipment (SS trowel, shovel, bowl and sample scoop). Decontamination consisted of sequentially immersing the sampling equipment in plastic tubs of decontamination solvents, scrubbing them with a brush and/or paper towels per the procedures in the Supplemental CMS Field Sampling Plan. The equipment blank was collected by pouring an appropriate volume of distilled water over the field-decontaminated soil sampling equipment into the appropriate sample bottles.

4.3 Surface Water (AOC B)

On June 8, 2015, EarthCon collected five surface water samples, one MS/MSD, and one field duplicate surface water sample from the channel of the Church House Branch, AOC B. **Table 3** provides detailed surface water sample information and location data, and surface water sample locations are shown on **Figure 3**. The samples were submitted for the following analyses:

- Pentachlorophenol (PCP);
- Select Polycyclic Aromatic Hydrocarbons (PAHs);
- Select metals: Arsenic, Chromium, Copper, Calcium, and Magnesium; and,
- Hardness.

The laboratory analytical results for the June 2015 surface water sampling event were compared against the corresponding draft ecological screening levels. The findings are summarized below and included in **Table 7. Figure 7** shows the detected analytical results for surface water by location.

4.3.1 Pentachlorophenol (PCP)

PCP was detected in two of the five surface water samples at concentrations ranging from 1.27 micrograms per Liter (ug/L) in **SW-3** to 1.4 ug/L at location **SW-2** (and in the duplicate sample **SW-6** collected at sample location **SW-2**). Concentrations in all surface water samples are below the chronic ecological screening value of 15 ug/L and the acute ecological screening value of 19 ug/L.

4.3.2 Polycyclic Aromatic Hydrocarbons (PAHs)

Four of the five surface water samples had non-detect concentrations of PAHs. Anthracene was

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the only PAH detected, and it was detected in one surface water sample **SW-3** above the draft ecological screening value for chronic effects:

- **SW-3** – Anthracene – 0.13 ug/L (Chronic screening value 0.02 ug/L).

Note that an estimated concentration of 0.0445 ug/L Anthracene was reported for duplicate sample **SW-6** collected from location **SW-2**; however, the reported Anthracene concentration in **SW-2** was non-detect.

4.3.3 Metals

Surface water samples were analyzed for select metals Arsenic, Chromium, Copper, Calcium, and Magnesium. All five of the surface water samples contained detections of four or more of these metals. Four of the surface water samples, **SW-1, SW-3, SW-4 and SW-5**, had concentrations below the draft ecological screening values. One sample had estimated concentrations above draft ecological screening values for two metals:

- **SW-2:**
  - Cr – estimated value of 114 ug/L (above the Chronic screening level 74 ug/L); and,
  - Cu – estimated value 83.5 ug/L (above the Chronic screening level of 9 ug/L, and the Acute screening level of 13 ug/L).

4.3.4 Hardness

Surface water analytical results for Hardness are included in **Table 7**. Hardness was collected in the event that hardness conversion was needed for screening level comparison. Such conversion was not conducted in this report, however the data was collected to allow for such conversion in the future, if necessary.

4.3.5 Quality Analysis/Quality Control (QA/QC)

Quality Assurance/Quality Control (QA/QC) procedures implemented during surface water sampling include collection and analysis of various samples as a check on sample collection, packing and transport procedures and analytical laboratory precision. Specific QA/QC samples collected during surface water sampling included a field duplicate, and matrix spike/matrix spike duplicate. The QA/QC results are summarized in the Data Validation Memos prepared by EarthCon's Senior Chemist and is included in **Appendix D**. Data qualification flags assigned as a result of the data validation are included in the analytical results **Tables 7**, and on the analytical laboratory data sheets in **Appendix E**. Based on the data validation, the analytical results were

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determined to be usable for the purposes of this investigation.

Duplicate Sample

Sample collection and laboratory analysis precision were evaluated by the collection and analysis of one blind duplicate surface water sample. Surface water sample **SW-6** was collected from the surface water sample location **SW-2** during the June 2015 sampling event. The duplicate sample was collected immediately after the original sample, stored in the same manner, and analyzed for the same parameters as the original sample.

Matrix Spike/Matrix Spike Duplicate

SW-MS/MSD was collected in the same manner as the duplicate surface water sample at the surface water sampling location of **SW-1**. The MS/MSD surface water sample was analyzed for the same parameters as the original sample; however these samples are spiked (in the laboratory) with known concentrations of the contaminants being analyzed to determine if the laboratory extraction and analysis procedures are working within the established control limits.

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5.0 ECOLOGICAL SCREENING

The laboratory analytical results of the soil, sediment and surface water samples collected on June 8 and 9, 2015 were compared to the draft ecological screening levels/values included in **Tables 1a, 1b, 1c, 2a, 2b, 2c,** and **3** in **Appendix A**. The analytes include the wood treating chemicals, As, Cr, Cu, PCP, and select PAHs. The analytical results and screening values are provided in **Tables 4, 5, 6,** and **7**. Results above the draft ecological screening levels/values are highlighted in yellow.

5.1 Soil (SWMU 37)

Soil samples were collected from Drainage Ditches 1, 2, 3 and 4 leading from the Closed Former Wood Treatment Units and Baldwin Pole Mississippi property to the Church House Branch (see **Figure 2**). The drainage ditches transmit intermittent flow of stormwater runoff and/or non-process wastewater discharge from Baldwin Pole Mississippi. The flow direction is from west to east, when there is flow. Given the purpose of this Supplemental CMS work, soil locations in the ditches were selected to assess the potential ecological risk due to potential exposure to soil within the ditches as well as to assess the potential for ongoing migration of suspended solids containing site-related constituents to Church House Branch (see **Figure 3**). The drainage ditches are accessible to ecological receptors along their entire length. The ditches run through pine forest and forested wetlands areas where birds and mammals and lesser so, fish, amphibians and reptiles, typical of this part of the country, may be present.

Soil sample analytical results were compared in **Table 4** to the appropriate draft ecological screening levels. The findings of this comparison are summarized below. Detected soil concentrations are shown on **Figure 4** by locations.

- Concentrations of As, PCP, LMW PAHs, and HMW PAHs were below the draft ecological screening levels for all soil samples;
- Cu was detected above the draft ecological screening level of 28 mg/Kg in **Soil 1** at 36.1 mg/Kg;
- Cr was detected above the draft ecological screening level of 28 mg/Kg in **Soil 4** at 36.9 mg/Kg.

Sample by sample location descriptions relevant to conditions represented by each sample and

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the presence/absence of ecological habitat/exposure potential are provided below:

- **Soil 1** was collected from the top 0 – 0.5 feet of soil in the downstream end of Ditch 4 prior to its entry-point into Church House Branch. Surface runoff drained by Ditch 4 comes from an area including three of the five Closed Former Wood Treating Units on IP property and the northern end of the Baldwin Pole Mississippi property. The three Closed Former Wood Treatment Units include the Closed Cellon, Penta and Creosote Recovery Ponds, the Closed MSU Landfarm, and the Close Contact Cooling Water Pond, which are fenced, regularly mowed and maintained as needed. The northern end of the Baldwin Pole Mississippi property includes two active wood treatment units; Treatment Area No. 1 (SWMUs 21-25, 38, 39), Treatment Area No. 2 (SWMUs 26-29, 23, 33), and a concrete drainage swale that connects to Ditch 4.

  Ditch 4 ranges from approximately 2 – 10 feet wide, approximately 1 – 5 feet deep, and is approximately 1,500 feet long. The soil in Ditch 4 consists of a mix of silt, sand and gravel with little organic material as evidenced by direct observation, grain size data and TOC analysis results. Surface water runoff flow through Ditch 4 varies with precipitation and Baldwin Pole facility runoff discharge and typically has no flow. The ditch is east of the Closed Cellon, Penta and Creosote Ponds, is subject to erosion and has been maintained over its lifetime, and as recently as in 2014, by changes in its layout and the movement, placement and compaction of soil by IP and Baldwin Pole Mississippi.

  The environmental setting in the area of Ditch 4 was previously determined to be pine forest extending into forested wetlands in the immediate vicinity of the Church House Branch (Premier, 2005). The extent of industrial activity and conditions in the Treatment Areas upstream of Ditch 4 are such that limited opportunity for contact by ecological receptors exists. Ditch 4 is available for contact by ecological receptors; however, the potential for contact is relatively small given the small area of Ditch 4 within the larger area of pine forest and forested wetlands along Church House Branch.

- **Soil 2** was collected from the top 0 – 0.5 feet of soil in the downstream end of Ditch 1, prior to its confluence with Ditch 2. Surface runoff drained by Ditch 1 comes from an area including two of the five Closed Former Wood Treating Units on IP property and part of the northern half of the Baldwin Pole Mississippi property. The two Closed Former Wood Treatment Units include the Closed Sludge Pits SL-2 & SL-3 and Closed Sludge Pits SL-4 & SL-5, which are both fenced and regularly mowed and maintained as, needed. The area of the northern half of the Baldwin Pole Mississippi property drained by Ditch 2 includes portions of the Pole Yard (AOC A).

  Ditch 1 ranges from approximately 2 – 5 feet wide, approximately 1 – 5 feet deep, and is approximately 600 feet long (prior to combining with Ditch 2). The soil in Ditch 1 consists of a mix of silt, sand and gravel with little organic material as evidenced by direct observation, grain size data and TOC analysis results. Surface water runoff flow through Ditch 1 varies with precipitation and at times has no flow. The ditch itself is subject to erosion and has been maintained over its lifetime by the placement of concrete rubble at the upstream culvert under the railroad tracks by IP and Baldwin Pole Mississippi to reduce erosion.

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The environmental setting in the area of Ditch 1 (prior to its confluence with Ditch 2) was previously determined to be pine forest (Premier, 2005). The extent of industrial activity and conditions in the Pole Yard area and in the area of the regularly mowed covers and land around the two Closed Former Wood Treatment Units upstream of Ditch 1 are such that limited opportunity for contact by ecological receptors exists. The Pole Yard is hard-packed silt, sand and gravel and provides little to no ecological habitat. Ditch 1 is available for contact by ecological receptors; however, the potential for contact is relatively small given the small area of Ditch 1 within the larger area of pine forest along the Church House Branch.

- **Soil 3** was collected from the top 0 – 0.5 feet of soil in the downstream end of Ditch 2, prior to its confluence with Ditch 1. Surface runoff drained by Ditch 2 comes from the northern half of the Baldwin Pole Mississippi property consisting of portions of the Pole Yard (AOC A).

  Ditch 2 ranges from approximately 5 – 10 feet wide, approximately 1 – 10 feet deep, and is approximately 600 feet long (prior to combining with Ditch 1). The soil in Ditch 2 consists of a mix of silt, sand and gravel with little organic material as evidenced by direct observation, grain size data and TOC analysis results. Surface water runoff flow through Ditch 2 varies with precipitation and at times has no flow. The ditch itself is subject to erosion and has been maintained over its lifetime by the placement concrete rubble at the upstream culvert under the railroad tracks by IP and Baldwin Pole Mississippi to reduce erosion.

  The environmental setting in the area of Ditch 2 (prior to combining with Ditch 1) was previously determined to be pine forest (Premier 2005). The extent of industrial activity and conditions in the Pole Yard area upstream of Ditch 2 are such that limited opportunity for contact by ecological receptors exists. The Pole Yard is hard-packed silt, sand and gravel and provides little to no ecological habitat. Ditch 2 is available for contact by ecological receptors, however, the potential for contact is relatively small given the small area of Ditch 2 within the larger area of pine forest along the Church House Branch.

- **Soil 4** and **Soil 6** (duplicate sample to **Soil 4**) were collected from the top 0 – 0.5 feet of soil in the downstream end of the combined stretch of Ditches 1 and 2, prior to its draining into the Church House Branch. Surface runoff drained by the combined Ditches 1 and 2 comes from the two approximately 600 feet long sections of Ditch 1 and Ditch 2 described above.

  The combined stretch of Ditches 1 and 2 ranges from approximately 5 – 10 feet wide, approximately 1 – 5 feet deep, and is approximately 600 feet long (from the point where Ditches 1 and 2 combine to the point of discharge into the Church House Branch). The soil in Ditch 2 consists of a mix of silt, sand and gravel as evidenced by direct observation, grain size data and TOC analysis results. Surface water runoff flow through the combined stretch of Ditches 1 and 2 varies with precipitation and at times has no flow. The ditch itself is subject to erosion and has been maintained over its lifetime by the placement concrete rubble at the upstream culvert under the railroad tracks by IP and Baldwin Pole

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Mississippi to reduce erosion.

The environmental setting in the area of the combined stretch of Ditches 1 and 2 was previously determined to be forested wetlands in the immediate vicinity of the Church House Branch (Premier 2005). The combined stretch of Ditches 1 and 2 is available for contact by ecological receptors; however, the potential for contact is relatively small given the small area of the combined stretch of Ditches 1 and 2 within the larger area of forested wetlands along the Church House Branch.

- **Soil 5** was collected from the top 0 – 0.5 feet of soil in the downstream end of Ditch 3 prior to its draining into the Church House Branch. Surface runoff drained by Ditch 3 comes from part of the southern half of the Baldwin Pole Mississippi property consisting of portions of the Pole Yard (AOC A).

  Ditch 3 ranges from approximately 5 – 10 feet wide, approximately 1 – 5 feet deep, and is approximately 1,000 feet long. The soil in Ditch 3 consists of a mix of silt, sand and gravel with little organic material as evidenced by direct observation, grain size data and TOC analysis results. Surface water runoff flow through Ditch 3 varies with precipitation and at times has no flow. The ditch itself is subject to erosion and has been maintained over its lifetime by the placement of concrete rubble at the upstream culvert under the railroad tracks by IP and Baldwin Pole Mississippi to reduce erosion.

  The environmental setting in the area of Ditch 3 (prior to its discharge into Church House Branch) was previously determined to be pine forest and forested wetlands in the immediate vicinity of the Church House Branch (see the Preliminary Corrective Measures Study, Premier, October 2005). The extent of industrial activity and conditions in the Pole Yard area upstream of Ditch 3 are such that limited opportunity for contact by ecological receptors exists. The Pole Yard is hard-packed silt, sand and gravel and provides little to no ecological habitat. Ditch 3 is available for contact by ecological receptors, however, the potential for contact is relatively small given the small area of Ditch 3 within the larger area of pine forest and forested wetlands along the Church House Branch.

<u>Soil Summary:</u>

- Soil sample analytical concentrations exceeded a single draft ecological screening level in two of the ditch soil samples, or approximately 6% of the total results.
- The draft ecological screening levels are based on conservative assumptions that may over-estimate the level of ecological risk posed by on-site soil conditions.
- The soil concentration and screening level comparison results demonstrate the effectiveness of source control measures already in place, including the well-maintained condition of the vegetated covers at the five Closed Former Wood Treating Units on-site, and the apparent effective maintenance and operation of the Baldwin Pole MS Treatment Units and Pole Yard with respect to the avoidance of wood treatment chemical impacts to surface runoff.
- There is little opportunity for exposure of ecological receptors in the industrial areas located upstream of the ditches. The small relative area of the ditches within the much larger pine forest and forested wetlands along the Church House Branch also reduces the

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opportunity for exposure of ecological receptors to the top 0 – 0.5 feet of soil within the ditches.

- The infrequent and isolated occurrence of soil concentrations above Draft Soil Screening Levels is not consistent with a pattern of historical release residue presence or ongoing release of site-related constituents to Ditch soil at concentrations above draft ecological screening levels.
- The reported soil concentrations and conditions present in soil in Ditches 1, 2, 3 and 4 are such that the potential for adverse exposure of ecological receptors is minimal and does not represent a concern for this media.
- Further, taking action to remove or remediate the soil concentration occurrences above Draft Sediment Screening Values would be far more damaging to ecological receptors than the potential level of risk indicated by leaving the soil concentrations in place.
- The above summary points are consistent with the findings of the ecological risk assessment previously submitted to EPA Region 4 in the Preliminary Corrective Measures Study Report, October 2005 (Premier, 2005).

5.2 Sediment (AOC B)

Sediment samples were collected from a stretch of the Church House Branch (AOC B), a slow moving braided stream that flows through a swampy area directly east of the IP Closed Former Wood Treating Units and the Baldwin Pole Mississippi property (see **Figure 2**). The stream flows to the south, so the northern-most sample location, **SD-1**, is the most upstream location (see **Figure 3**). Surface water runoff enters the Church House Branch from the east and the west along its length. Ditches 1, 2, 3 and 4 discharge surface runoff to Church House Branch from the area of the IP Closed Former Wood Treating Units and the Baldwin Pole Mississippi property. Given the purpose of this Supplemental CMS work, sediment locations were selected for sampling given their proximity to these drainage ditches. The Church House Branch is a wetlands area with the potential presence of numerous benthic and aquatic organisms including fish, amphibians, reptiles, birds and mammals typical of this part of the country.

In order to provide an updated assessment of the potential ecological risk based on the potential exposure of ecological receptors to sediment, the analytical results in **Tables 5** and **6** were compared to draft ecological screening values in **Tables 2a, 2b and 2c** in **Appendix A.** Detected analytical results and the ESBTU results are shown on **Figures 5** and **6.**

- A comparison was made to the draft non-narcotic freshwater screening values for chronic and acute exposure for the three select metals analyzed, As, Cr and Cu, as well as PCP;

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- A comparison was made to the draft narcosis freshwater screening values for the analyzed PAHs; and
- The ESBTUs (Equilibrium Partitioning Sediment Benchmark Toxic Units) were calculated for PAHs for comparison to a threshold of 1 based on the reported PAH and TOC concentrations and the draft organic carbon normalized narcosis screening values for PAHs.

These comparisons resulted in the following findings:

Comparison of Reported Sediment Concentrations to Screening Values (see **Table 5**):

- Analytical results were below the draft ecological screening levels for non-narcotic or narcosis effects at six of the eleven sediment sample locations: **SD-1, SD-4, SD-7, SD-8, SD-9** and **SD-10**.
- As, Cr, and Cu were above the draft ecological screening levels for chronic non-narcotic effects in two of the eleven sediment samples (**SD-3** and **SD-5**). However, the concentrations of these three metals were below the draft ecological screening levels for acute non-narcotic effects in all 11 sediment samples collected. The As concentrations were 13.5 and 18.8 mg/Kg, in samples **SD-3** and **SD- 5**, respectively (the chronic screening value is 9.8 mg/kg). The Cr concentrations were 56.2 and 56.9 mg/Kg in samples **SD-3** and **SD-5**, respectively (the chronic screening value is 43.4 mg/Kg). The Cu concentrations were 42.9 and an estimated 33.2 mg/Kg in samples **SD-3** and **SD-5**, respectively (the chronic screening level is 31.6 mg/Kg).
- Pentachlorophenol (PCP) was detected above the draft ecological screening level for non-narcotic effects of 1,200 ug/Kg for acute exposures and 744 ug/Kg for chronic exposures in two of the eleven sediment samples (**SD-3** and **SD-5**). **SD-3** had a concentration of 1,680 ug/Kg and **SD-5** had a concentration of 1,950 ug/Kg.
- Of the eighteen PAHs analyzed, only two (Fluoranthene and Anthracene) were detected above the draft ecological screening values for narcosis effects. Fluoranthene was above the draft screening level of 241 ug/Kg in one sediment sample, **SD-2** – 895 ug/Kg. Anthracene was above the draft screening level of 3.3 ug/Kg in five samples: **SD-2** – 185 ug/Kg, **SD-3** – 131 ug/Kg, **SD-5** – 66.8 ug/Kg, **SD-6** – 4.29 ug/Kg, and **SD-11/SD-12** – 21.1/21.7 ug/Kg (**SD-12** was the duplicate sample to **SD-11**).

Comparison of ESBTUs to 1 (see **Table 6**):

- The reported sediment concentrations in the sediment samples (eleven field samples and one duplicate) were normalized for organic carbon content for each of eighteen PAHs by dividing the reported PAH concentration by the f_{oc} – the organic carbon fraction in each sample. The f_{oc} for each sample was obtained by dividing the Total Organic Carbon (TOC) analytical result in mg/Kg by 10,000. This result was then multiplied by 1,000 to convert the units to ug/gOC, and divided by the organic carbon normalized narcosis screening value which are also in the units of ug/gOC[1] to obtain a unit less Toxic Units (TU) value

[1] No units are listed for the Organic Carbon Normalized Freshwater Narcosis Screening Values for each PAH in the Supplemental CMS Work Plan Table 2c, which was provide to International Paper by EPA Region 4. It was assumed that the correct units are ug/gOC for use in this report.

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for each PAH. The TUs were summed for each sample and then compared to the Equilibrium Partitioning Sediment Benchmark Toxic Unit (ESBTU) of 1. The ESBTU is based on the sum of 34 PAHs. For this site, a total of 18 PAHs were analyzed, therefore, an adjustment is needed to account for the lower number of PAHs analyzed. The literature provides for an adjustment multiplier of 11.5 when 13 PAHs are summed, and 1.64 when 23 PAHs are summed. Since there is no specific adjustment for 18 PAHs, both of these adjustments factors were included for evaluation. The reported PAH concentrations, PAH and sample-specific TUs, the organic carbon normalized narcosis screening values for each PAH, the ESBTU and the two adjusted ESBTUs for each sample, are provided in **Table 6**.

- The ESBTU and the two adjusted ESBTUs were below 1 for six of the eleven sediment samples: **SD-1, SD-3, SD-5, SD-9, SD-10, SD-11/SD-12** (**SD-12** is the field duplicate of **SD-11**).
- The lower adjusted ESBTU*1.64 was above 1 in three of the eleven sediment samples: **SD-2**, **SD-7** and **SD-8**.
- The higher adjusted ESBTU*11.5 was above 1 in five of the eleven sediment samples: **SD-2, SD-4, SD-6, SD-7** and **SD-8**.

The sediment sample collection location descriptions in **Table 2** and other visual observations and screening level comparisons that are relevant to conditions represented by each sample location include the following:

- **SD-1** was collected from the top 0 – 0.5 feet of bottom sediment in Church House Branch at a point upstream from the northern-most point of surface runoff drainage into the Church House Branch from the Closed Former Wood Treatment Units and Baldwin Pole Mississippi property.

  Sediment quality at this location is considered generally indicative of conditions upstream of the Site. **SD-1** was collected approximately 600 feet upstream from the discharge point of Ditch 4 into the Church House Branch. Surface water in the Church House Branch was approximately 0.5 feet deep and approximately 4 feet wide at the point where **SD-1** was collected. The sediment consisted largely of sandy mud. The bank was vegetated and soft and vegetation was present growing within the area of standing water.

  Sediment concentrations were below draft ecological screening values for non-narcotic effects for As, Cr, Cu and PCP, and below the draft ecological screening values for narcosis effects and the ESBTU and adjusted ESBTU values of 1 for PAHs at this location. These results are indicative of no adverse ecological risk in sediment at this location.

- **SD-2** was collected from the top 0 – 0.5 feet of bottom sediment in the Church House Branch immediately at the discharge point of Ditch 4. Ditch 4 drains surface runoff from the area of three of the five Closed Former Wood Treating Units on IP property and the northern end of the Baldwin Pole Mississippi property. The three Closed Former Wood Treatment Units include the Closed Cellon, Penta and Creosote Recovery Ponds, the Closed MSU Landfarm, and the Close Contact Cooling Water Pond, which are covered,

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fenced, regularly mowed and maintained, as needed. The northern end of the Baldwin Pole Mississippi property includes two active wood treatment units; Treatment Area No. 1 (SWMUs 21-25, 38, 39) and Treatment Area No. 2 (SWMUs 26-29, 23, 33).

Sediment quality at this location is considered generally indicative of the accumulation of sediment at this location from upstream areas within the Church House Branch watershed, including the cumulative residue of site-related constituents resulting from past or present migration of suspended solids transported by surface runoff in Ditch 4. Surface water in the Church House Branch was approximately 1 foot deep and approximately 100 feet wide at the point where **SD-2** was collected. The sediment consisted largely of sandy mud. The bank was vegetated and soft and vegetation was present growing within the area of standing water.

Sediment concentrations were below the draft ecological screening values for non-narcotic effects for As, Cr, Cu and PCP. These results are indicative of no adverse ecological risk for the primary wood treating chemicals of As, Cr, Cu and PCP. Two of the eighteen PAHs analyzed (Fluoranthene and Anthracene) were present at concentrations above draft ecological screening values for narcosis effects, and organic carbon normalized PAHs were present above the ESBTU and adjusted ESBTU values of 1. The PAH screening results could be indicative of some level of adverse risk due to the presence of PAHs.

- **SD-3** was collected from the top 0 – 0.5 feet of bottom sediment in the Church House Branch from a point approximately 400 feet downstream from the discharge point of Ditch 4 (described above).

  Sediment quality at this location is considered generally indicative of the potential for past migration of site-related constituents at **SD-2** to sediment in the area immediately downstream at **SD-3**. Surface water in the Church House Branch was approximately 1 foot deep and approximately 25 feet wide at the point where **SD-3** was collected. The sediment consisted largely of muddy sand. The bank was vegetated and soft and vegetation was present growing within the area of standing water.

  Sediment concentrations at this location were above the chronic, but below the acute effects non-narcotic draft ecological screening values for As, Cr, Cu. The PCP concentration was above the non-narcotic draft ecological screening values for both acute and chronic effects. One of eighteen PAHs analyzed (Anthracene) was above the draft ecological screening values for narcosis effects, however the organic carbon normalized PAHs were below the ESBTU and adjusted ESBTU values of 1. Although the metals and PCP results may be indicative of some adverse level of ecological risk, the PAHs results are not indicative of significant ecological risk at this location.

- **SD-4** was collected from the top 0 – 0.5 feet of bottom sediment in the Church House Branch immediately at the discharge point of the combined Ditches 1 and 2. The combined Ditches 1 and 2 drains surface runoff from the area of two of the five Closed Former Wood Treating Units on IP property and the northern end of the Baldwin Pole Mississippi property. The two Closed Former Wood Treatment Units include the Closed

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Sludge Pits SL-2 & SL-3 and SL-4 & SL-5, which are covered, fenced and regularly mowed and maintained, as needed. The area of the northern half of the Baldwin Pole Mississippi property drained by the combined Ditch 1 and Ditch 2 includes portions of the Pole Yard (AOC A).

Sediment quality at this location is considered generally indicative of the cumulative residue of site-related constituents deposited at this location from the past or present migration of suspended solids in Ditch 1 and Ditch 2 as well as migration to this point from other upstream areas. Surface water in the Church House Branch was approximately 0.5 feet deep and approximately 2 feet wide at the point where **SD-4** was collected. The sediment consisted largely of sand. The bank was vegetated and soft and no vegetation was present growing within the area of standing water due to water flow.

Sediment concentrations at this location were below draft ecological screening values for non-narcotic effects for both acute and chronic effects for As, Cr, Cu, PCP and PAHs. Organic carbon normalized PAHs were present below the ESBTU and the lower adjusted ESBTU*1.64 values of 1, however, the higher adjusted ESBTU*11.5 of 2.6 is above 1. Considered together, these results are largely indicative of no adverse ecological risk for the migration of suspended solids to sediment at **SD-4** for the primary wood treating chemicals As, Cr, Cu and PCP. However, the PAH screening results could be indicative of some level of adverse risk due to the presence of the PAHs.

- **SD-5** was collected from the top 0 to 0.5 feet of bottom sediment in the Church House Branch from a point approximately 350 feet downstream from the discharge point of the combined Ditches 1 and Ditch 2 (described above).

  Sediment quality at this location is considered generally indicative of the potential for past migration of site-related constituents at **SD-4** to sediment in the area immediately downstream at **SD-5**, as well as migration to this point from other upstream locations. Surface water in the Church House Branch was approximately 1.5 feet deep and approximately 40 feet wide at the point where **SD-5** was collected. The sediment consisted of brownish gray mud. The bank was vegetated and soft and some vegetation was present growing within the area of standing water due to water flow.

  Sediment concentrations at this location were above the chronic effects, but below the acute effects draft non-narcotic ecological screening levels for As, Cr and Cu. The PCP concentration was above both the acute and chronic effects draft ecological non-narcotic screening levels. One of eighteen PAHs analyzed (Anthracene), was present at a concentration above the draft narcosis effects screening value, however the organic carbon normalized PAHs were present below the ESBTU and adjusted ESBTU values of 1. Although the metals and PCP results may be indicative of some adverse level of ecological risk, the PAHs results are not indicative of significant ecological risk at this location.

- **SD-6** was collected from the top 0 – 0.5 feet of bottom sediment in the Church House Branch immediately at the discharge point of Ditch 3. Ditch 3 drains surface runoff from an area of the southern half of the Baldwin Pole Mississippi property including portions of

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the Pole Yard (AOC A) and is the southern-most drainage ditch into the Church House Branch from the Site and the Baldwin Pole property.

Sediment quality at this location is considered generally indicative of the cumulative residue of site-related constituents deposited at this location from the past or present migration of suspended solids in Ditch 3, as well as migration to this point from other upstream locations. Surface water in the Church House Branch was approximately 1 foot deep and approximately 20 feet wide at the point where **SD-6** was collected. The sediment consisted largely of light brown sand and gravel. The bank was slightly vegetated and soft and little vegetation was present growing within the area of standing water due to water flow.

Sediment concentrations at this location were below draft ecological screening levels for non-narcotic effects for both acute and chronic effects for As, Cr, Cu, and PCP. One of the eighteen PAHs analyzed (Anthracene) was present above the draft ecological screening level for narcosis effects. PAHs were present below the ESBTU and the lower adjusted ESBTU*1.64 values of 1, however, the higher adjusted ESBTU*11.5 of 2.2 is above 1. Considered together, these results are largely indicative of no adverse ecological risk for the migration of suspended solids to sediment at **SD-6** for the primary wood treating chemicals of As, Cr, Cu and PCP. However, the PAH screening results could be indicative of some level of adverse risk due to the presence of the PAHs.

- **SD-7** was collected from the top 0 – 0.5 feet of bottom sediment in Church House Branch from a point approximately 425 feet downstream from the discharge point of Ditch 3 (described above).

  Sediment quality at this location is considered generally indicative of the potential for past migration of site-related constituents from **SD-6** as well as other upstream locations to sediment in the area immediately downstream at **SD-7**. Surface water in the Church House Branch was approximately 0.5 feet deep and approximately 2 feet wide at the point where **SD-7** was collected. The sediment consisted largely of light brown sand. The bank was vegetated and soft and little vegetation was present growing within the area of standing water due to water flow.

  Sediment concentrations at this location were below draft ecological screening levels for non-narcotic effects for both acute and chronic effects for As, Cr, Cu, PCP, and PAHs. Organic carbon normalized PAHs were present below the ESBTU value of 1, but above 1 for the adjusted ESBTU values. Considered together, these results are largely indicative of no adverse ecological risk for the migration of suspended solids to sediment at **SD-7** resulting from downstream migration from **SD-6** and other upstream points, with respect to the wood treating chemicals As, Cr, Cu and PCP, with a possible adverse impact due to the presence of PAHs.

- **SD-8** sample was collected from the top 0 – 0.5 feet of bottom sediment in the Church House Branch from a point approximately 650 feet downstream from the discharge point of Ditch 3 (described above).

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Sediment quality at this location is considered generally indicative of the potential for past migration of site-related constituents from **SD-7** as well as other upstream locations to sediment in the area immediately downstream at **SD-8**. Surface water in Church House Branch was approximately 0.75 feet deep and approximately 2 feet wide at the point where **SD-8** was collected. The sediment consisted largely of dark brown sand. The bank was vegetated and soft and little vegetation was present growing within the area of standing water due to water flow.

Sediment concentrations at this location were below draft ecological screening levels for non-narcotic effects for both acute and chronic effects for As, Cr, Cu, PCP, and PAHs. However, The ESBTU and adjusted ESBTUs were above 1. Considered together, these results are largely indicative of no adverse ecological risk for the migration of suspended solids to sediment at **SD-8** resulting from downstream migration from upstream points, with respect to the wood treating chemicals As, Cr, Cu and PCP, with a possible adverse impact due to the presence of PAHs.

- **SD-9** was collected from the top 0 – 0.5 feet of bottom sediment in the Church House Branch from a point approximately 800 feet downstream from the discharge point of Ditch 3 (described above).

  Sediment quality at this location is considered generally indicative of the potential for past migration of site-related constituents from upstream locations. Surface water in the Church House Branch was approximately 0.5 feet deep and approximately 10 feet wide at the point where **SD-9** was collected. The sediment consisted largely of light brown sand. The bank was vegetated and soft and little vegetation was present growing within the area of standing water due to water flow.

  Sediment concentrations at this location were below draft ecological screening levels for non-narcotic effects for both acute and chronic effects for As, Cr, Cu, PCP, and PAHs. The ESBTU and adjusted ESBTUs were all below 1. These results are indicative of no adverse ecological risk for the migration of suspended solids to sediment at **SD-9** resulting from downstream migration from upstream points, with respect to the wood treating chemicals As, Cr, Cu and PCP, and PAHs.

- **SD-10** was collected from the top 0 – 0.5 feet of bottom sediment in the Church House Branch from a point approximately 950 feet downstream from the discharge point of Ditch 3 (described above).

  Sediment quality at this location is considered generally indicative of the potential for past migration of site-related constituents from upstream locations to sediment in the area of **SD-10**. Surface water in the Church House Branch was approximately 0.5 feet deep and approximately 5 feet wide at the point where **SD-10** was collected. The sediment consisted largely of light brown sand. The bank was vegetated and soft and little vegetation was present growing within the area of standing water due to water flow.

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Sediment concentrations at this location were below draft ecological screening levels for non-narcotic effects for both acute and chronic effects for As, Cr, Cu, PCP, and PAHs. The ESBTU and adjusted ESBTUs were all below 1. These results are indicative of no adverse ecological risk for the migration of suspended solids to sediment at **SD-10** resulting from downstream migration from upstream points, with respect to the wood treating chemicals As, Cr, Cu and PCP, and PAHs.

- **SD-11** was collected in duplicate (**SD-12**) from the top 0 to 0.5 feet of bottom sediment in the Church House Branch from a point approximately 1,200 feet downstream from the discharge point of Ditch 3 (described above).

  Sediment quality at this location is considered generally indicative of the potential for past migration of site-related constituents from upstream locations to sediment in the area of **SD-11**. Surface water in the Church House Branch was approximately 0.5 feet deep and approximately 2 feet wide at the point where **SD-11** was collected. The sediment consisted largely of dark gray muck. The bank was vegetated and soft and little vegetation was present growing within the area of standing water due to water flow.

  Sediment concentrations at this location were below draft ecological screening levels for non-narcotic effects for both acute and chronic effects for As, Cr, Cu, PCP. One PAH of the eighteen analyzed (Anthracene) was above the draft ecological screening levels for narcosis effects. However, the ESBTU, and adjusted ESBTUs were all below 1. Considered together, these results are indicative of no adverse ecological risk for the migration of suspended solids to sediment at **SD-11** resulting from downstream migration upstream points, with respect to the wood treating chemicals As, Cr, Cu and PCP, and PAHs.

<u>Sediment Summary</u>:

- Sediment concentrations were above at least one of the twenty-two draft ecological screening values (As, Cr, Cu, PCP, 18 PAHs) in five of the eleven sediment samples. Concentrations were above screening values for one compound in two samples, for two compounds in one sample, and for five compounds in two samples. For the eleven sediment samples, there were a total of 14 instances of a result above a screening value out of a total of 242 comparisons, or approximately 6% of the comparisons.
- For the organic carbon normalized PAH concentrations comparisons to ESBTUs, there were two samples of eleven with an ESBTU above 1, 3 samples above 1 for the adjusted ESBTU*1.64, and 5 samples above 1 for the ESBTU*11.5.
- The draft ecological screening levels are based on conservative assumptions that may over-estimate the level of ecological risk posed by sediment conditions within Church House Branch.
- Seven of the nine instances of sediment concentrations above the draft ecological screening values are in sediment samples located in the vicinity of drainage ditch inflows to the Church House Branch. These results are consistent with the historic drainage pattern for areas of the Closed Former Wood Treating Units on IP property and Baldwin Pole Mississippi property where wood treatment chemicals were used or recycled. When considered with the drainage ditch soil sample results, and the source control measures

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already in place, including the well-maintained condition of the vegetated covers at the five Closed Former Wood Treating Units on-site, and the apparent effective maintenance and operation of the Baldwin Pole MS Treatment Units and Pole Yard with respect to the avoidance of wood treatment chemical impacts to surface runoff, the sediment results appear to be indicative of historical residues in sediment.

- The few infrequent occurrences of sediment concentrations above draft ecological screening values demonstrate a limited area and pattern of historical release residues in sediments that is largely in the immediate vicinity of drainage ditches inflow points. Accordingly, the potential for adverse exposure of ecological receptors to sediment is minimal and not of concern for this media.
- Taking actions to remediate the limited sediment concentration occurrences above Draft Sediment Screening Values would be far more damaging to ecological receptors than the potential level of risk indicated by leaving the sediment concentrations in place.
- The above summary points are consistent with the findings of the ecological risk assessment previously submitted to EPA Region 4 in the Preliminary Corrective Measures Study Report, October 2005 (Premier, 2005).

5.3 Surface Water (AOC B)

Surface water samples were collected from Church House Branch (AOC B) (See **Figure 2**), a slow moving braided stream that flows through a swampy area directly east of the Closed Former Wood Treatment Units site and Baldwin Pole Mississippi property. The stream flows to the south, so the northern-most sample location **SW-1** was the most upstream location sampled. Surface water runoff enters Church House Branch from the east and the west along its length. Ditches 1, 2, 3 and 4 discharge surface runoff to the Church House Branch from the area of the Site and Baldwin Pole property. Given the purpose of this Supplemental CMS work, surface water locations were selected for sampling given their proximity to these drainage ditches. Three of the five surface water locations are co-located at locations where sediment samples were collected (see **Table 3**). The Church House Branch is a wetlands area with the potential presence of numerous benthic and aquatic organisms including fish, amphibians, reptiles, birds and mammals typical of this part of the country.

Surface water sample analytical results were compared in **Table 7** to draft ecological screening values in Table 1a of **Appendix A**. Detected surface water analytical results are shown on **Figure 7**. The comparison to screening levels resulted in the following findings:[2]

[2] Calcium (Ca) and Magnesium (Mg) were included in the metals analysis but they are not considered site-related constituents. All surface water sample analytical results were below the draft ecological

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- As and PCP were below the draft ecological screening values for chronic and acute exposure for all five surface water locations **SW-1 through SW-5** (**SW-6** was the field duplicate for **SW-2**).
- Cr was detected above the draft ecological screening value for chronic effects (74 ug/L) in **SW-2** at an estimated concentration of 114 ug/L. However, the field duplicate (**SW-6**) concentration (estimated concentration of 63.7 ug/L) was below the draft ecological screening value for chronic effects. Both **SW-2** and **SW-6** were below the draft ecological screening value for acute effects. All other surface water locations were below the draft ecological screening values for Cr for both chronic and acute effects.
- Cu was detected above the draft ecological screening values for chronic effects of 9 ug/L and acute effects of 13 ug/L at location **SW-2** at an estimated concentration of 83.5 ug/L and its field duplicate **SW-6** at an estimated concentration of 46.2 ug/L. All other locations were below the draft ecological screening values for Cu for both chronic and acute effects.
- One of the eighteen PAHs analyzed (Anthracene) was above the draft ecological screening value for chronic effects of 0.02 ug/L in two samples. **SW-3** had an Anthracene concentration of 0.13 ug/L. SW-6, the duplicate sample of **SW2** contained an estimated concentration of Anthracene at 0.0445 ug/L, although the field sample collected at this location was non-detect. All other PAHs in the other surface water samples were below the draft ecological screening values for PAHs for both chronic and acute effects.

The surface water sample location for **SW-1** location was previously described for sediment locations **SD-1** as the surface water sample was co-located with the sediment sample location. Descriptions of surface water sample locations **SW-2**, **SW-3** and **SW-4** which were co-located along with sediment sampling locations **SD-3**, **SD-5** and **SD-10** can also be found in the previous section. The description for surface water sample **SW-5** which was located further downstream than any of the surface water/sediment samples that were collected is as follows:

- **SW-5** was collected from the top 0 – 1 foot of surface water in the Church House Branch at a point approximately 3,000 feet downstream from the southern-most ditch discharge point at Ditch 3.

  Surface water quality at this location is considered generally indicative of the potential for migration of site-related constituents from points upstream including Ditch 4, the combined Ditch 1 and Ditch 2, and Ditch 3. Surface water in the Church House Branch was approximately 0.5 feet deep and approximately 5 feet wide at the point where SW-5 was collected.

  Surface water concentrations at this location were below the draft ecological screening

screening values for chronic effects for Ca and Mg. There are no acute effects screening levels for Ca and Mg. These comparisons are not included in the report where screening levels comparisons are made for site-related constituents.

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values for As, Cr, Cu, PCP, and PAHs. These results are indicative of no adverse ecological risk related to site-related constituents at this location.

Surface Water Summary:

- Surface water concentrations were above at least one of twenty-two draft ecological screening values (As, Cr, Cu, PCP, 18 PAHs)[2] in two surface water samples, **SW-2** (and its duplicate **SW-6**), and **SW-3**. In sample SW-2 concentrations were above three screening values (Cr, Cu and Anthracene). The screening level concentration of Anthracene was exceeded in sample SW-3. For the five total surface water samples, there were five instances of a result above a draft ecological screening value out of a total of 110 comparisons (five samples each compared to draft ecological screening values for twenty-two site-related constituents), or approximately 4% of the comparisons.
- The draft ecological screening values are based on conservative assumptions that may over-estimate the level of ecological risk posed by on-site surface water conditions.
- All five instances of surface water concentrations above the draft ecological screening values are in surface water samples collected within approximately 350 to 400 feet of a drainage ditch inflow to the Church House Branch. Although few and infrequent, these results are consistent with the historic drainage pattern from areas of the Closed Former Wood Treating Units on IP property and Baldwin Pole Mississippi property where wood treatment chemicals were used or recycled.
- The few infrequent occurrences of surface water concentrations above draft ecological screening values demonstrate a limited area and pattern of historical release residues in surface water that is largely limited to the areas of the Church House Branch in the vicinity of drainage ditch inflows. The potential for adverse exposure of ecological receptors to surface water downstream from these locations appears to be minimal and not of concern for this media.
- The above summary points are consistent with the findings of the ecological risk assessment previously submitted to EPA Region 4 in the Preliminary Corrective Measures Study Report, October 2005 (Premier, 2005).

5.4 Ecological Screening Summary

SOIL (SWMU 37)

- Soil concentrations were above a single draft ecological screening level in only two of the five ditch soil samples. The results represent only approximately 6% of the total of 110 soil screening comparisons (five samples for twenty-two compounds - As, Cr, Cu, PCP, 18 PAHs).

SEDIMENT (AOC B)

- Sediment concentrations were above at least one of the twenty-two draft ecological screening values in only five of the eleven sediment samples. Concentrations were above screening values for one compound in two samples, for two compounds in one sample, and for five compounds in two samples. For the eleven sediment samples collected, there were a total of 14 instances of a result above a screening value out of a total of 242 comparisons, or approximately 6% of the comparisons.

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- For the organic carbon normalized PAH concentrations comparisons to ESBTUs, there were two samples of eleven with an ESBTU above 1, 3 samples above 1 for the adjusted ESBTU*1.64, and 5 samples above 1 for the ESBTU*11.5.
- Seven of the nine instances of analyte concentrations above the draft ecological screening values are in sediment samples are located in the vicinity of drainage ditch inflows to the Church House Branch. These results are consistent with the historic drainage pattern for areas of the Closed Former Wood Treating Units on IP property and Baldwin Pole Mississippi property where wood treatment chemicals were used or recycled.
- When considered in conjunction with the drainage ditch soil results, the sediment results are indicated to be the historical residue from past releases.

SURFACE WATER (AOC B)

- Surface water results were above at least one of twenty-two draft ecological screening values in two of five surface water samples. One sample was above screening levels for Cr, Cu and Anthracene, and one was above the screening level for anthracene. The sample with the most compounds above screening level was located at the mouth of Drainage Ditch 4 which is the most upstream of the sample locations that receive runoff from IP and Baldwin Pole Mississippi property. For the five total surface water samples, the four results above screening levels represent approximately 4% of the total of 110 comparisons.
- All five instances of surface water concentrations above the draft ecological screening values are in surface water samples collected within approximately 350 to 400 feet of a drainage ditch inflow to the Church House Branch consistent with the historic drainage pattern from areas of the Closed Former Wood Treating Units on IP property and Baldwin Pole Mississippi property where wood treatment chemicals were used or recycled.
- The few infrequent occurrences of surface water concentrations above draft ecological screening values demonstrate a limited area and current pattern of historical release residues in surface water that are limited to the areas of the Church House Branch in the immediate vicinity of drainage ditch inflows. There is no pattern of downstream migration of concentrations above screening levels.

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6.0 SUMMARY AND CONCLUSIONS

The soil, sediment and surface water analytical and ecological screening results discussed in this report indicate that a localized presence of wood treatment chemicals exists in Church House Branch. There are some occurrences of metals and PAH concentrations above conservative draft ecological screening values/levels; however, their limited presence does not indicate that an adverse condition exists sufficient to justify remedial action. In addition, there is no pattern of downstream migration of concentrations above screening levels.

A pattern of ongoing release is not indicated by the results. The results are indicative of a historical residue from past releases. The results demonstrate the effectiveness of source control measures already in place, including the well-maintained condition of the vegetated covers at the five Closed Former Wood Treating Units on IP property, and the apparent effective maintenance and operation of the Baldwin Pole MS Treatment Units and Pole Yard with respect to the avoidance of wood treatment chemical impacts to surface runoff.

Considering that the draft ecological screening values/levels are based on conservative assumptions that may over-estimate the level of ecological risk posed by on-site soil conditions, taking action to remove or remediate the limited occurrences above screening levels would potentially be far more damaging to ecological receptors than the limited level of risk indicated by the detected concentrations. This conclusion is consistent with the findings of the ecological risk assessment previously submitted to EPA in the PCMS in 2005.

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TABLES

TABLE 1. Soil Sample Summary
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSWA Permit No. 980-600-084

Sample ID	Sample Date	Location Lat/Long	Location Description	Sample Depth (feet)	Sample Description	Analysis	Reference to 2005 PCMS Sample location
Soil 1	6/9/15	N. 30.83722 W. 89.12505	Downstream end of Ditch 4	0-0.5	light brown sand	PCP/ PAHs/ Metals/ TOC/ Grain Size*/DUP	NA
Soil 2	6/9/15	N. 30.83469 W. 89.12446	Downstream end of Ditch 1	0-0.5	1-2" clay with red sand, 2-6" gray brown clay	PCP/ PAHs/ Metals/ TOC/MS-MSD	SL-D1-C
Soil 3	6/9/15	N 30.83469 W 89.12438	Downstream end of Ditch 2	0-0.5	light brown sand	PCP/ PAHs/ Metals/ TOC	SL-D2-C
Soil 4	6/9/15	N. 30.83527 W. 89.12284	Downstream of the confluence of Ditches 1 and 2	0-0.5	1-3" sand, 3-6" reddish gray sandy clay	PCP/ PAHs/ Metals/ TOC	SL-D1-3
Soil 5	6/9/15	N. 30.83360 W. 89.12176	Downstream end of Ditch 3	0-0.5	1-3" light brown sand, 3-6" red/ brown clayey sand	PCP/ PAHs/ Metals/ TOC/ Grain Size*	SL-D3-4

NOTES:

Metals - As, Cr, Cu
PCP - Pentachlorophenol
PAHs - Polycyclic Aromatic Hydrocarbons
DUP - Field duplicate sample MS/ MSD - Matrix Spike / Matrix Spike Duplicate EB - Equipment Blank QA/QC - Quality Assurance/Quality Control

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Checked by: DES 8/5/15

TABLE 2. Sediment Sample Summary
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSWA Permit No. 980-600-084

Sample ID	Sample Date	Location Lat/Long	Location Description	Sample Depth (feet)	Sample Description	Analysis	Reference to 2005 PCMS Sample location
SD-1	6/9/15	N 30.83797 W 89.12623	500 feet N of Ditch 4 upstream bend	0-0.5 feet	4 inches deep brown sandy mud.	PCP/ PAHs/ Metals/ TOC/ MS/MSD	NA
SD-2	6/9/15	N 30.83744 W 89.12493	Near Soil 1 at mouth of Ditch 4	0-0.5 feet	Muddy with plant material	PCP/ PAHs/ Metals/ TOC/DUP	NA
SD-3	6/9/15	N 30.83642 W 89.12424	In channel near SD-5 between Ditches 2 and 3	0-0.5 feet	Stagnant water, 1 foot deep, muddy	PCP/ PAHs/ Metals/ TOC	NA
SD-4	6/9/15	N 30.83549 W 89.12269	Near SD-10 1,500 feet NNW of SW-5	0-0.5 feet	Sandy, 1.5' wide, 6" deep	PCP/ PAHs/ Metals/ TOC	NA
SD-5	6/9/15	N 30.83420 W 89.12231	Near SW-3 midway between Ditch 2 and 3	0-0.5 feet	Brownish gray organic rich	PCP/ PAHs/ Metals/ TOC/MS/MSD	NA
SD-6	6/9/15	N 30.83367 W 89.12151	Mouth of Ditch 3	0-0.5 feet	Light brown sand and gravel	PCP/ PAHs/ Metals/ TOC/Grain Size	NA
SD-7	6/9/15	N 30.83286 W 89.12016	Stream channel 400 feet SE of SD-6	0-0.5 feet	Light brown sand	PCP/ PAHs/ Metals/ TOC	NA
SD-8	6/9/15	N 30.83277 W 89.11971	Stagnant pool near SD-9	0-0.5 feet	Dark brown sand	PCP/ PAHs/ Metals/ TOC	SD-05
SD-9	6/9/15	N 30.83280 W 89.11960	Stream channel 800 feet SE of Ditch 3	0-0.5 feet	light brown sand	PCP/ PAHs/ Metals/ TOC	SD-04
SD-10	6/9/15	N 30.83153 W 89.11912	Pool near SW-4 1,000 feet E of road	0-0.5 feet	light brown sand	PCP/ PAHs/ Metals/ TOC	SD-03
SD-11	6/9/15	N 30.83119 W 89.11865	Southern-most sediment sample 300 feet SE of SD-10	0-0.5 feet	Dark gray muck	PCP/ PAHs/ Metals/ TOC/Grain Size	NA

NOTES:
Metals - As, Cr, Cu
PCP - Pentachlorophenol
PAHs - Polycyclic Aromatic Hydrocarbons
DUP - Field duplicate sample MS/ MSD - Matrix Spike / Matrix Spike Duplicate EB - Equipment Blank

Prepared by: CHT 7/16/15
Checked by: DES 8/5/15

TABLE 3. Surface Water Sample Summary
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSWA Permit No. 980-600-084

Sample ID	Sample Date	Location Lat/Long	Location Description	Sample Depth (feet)	Sample Description	Analysis	Reference to 2005 PCMS Sample location
SW-1	6/8/15	N. 30.83797 W. 89.12623	500 feet N of Ditch 4 upstream bend	0-1 foot from surface	0.33 feet deep, brown sandy mud	PCP/ PAHs/ Metals/ TOC/ MS/MSD	SW-04
SW-2	6/8/15	N. 30.83642 W. 89.12424	In stream, near SD-3, midway between Ditch 1 and 4	0-1 foot from surface	Muddy with plant material	PCP/ PAHs/ Metals/ TOC/DUP	NA
SW-3	6/8/15	N. 30.83420 W. 89.12231	In stream near SD-5 between Ditches 2 and 3	0-1 foot from surface	Stagnant water, 1 foot deep, muddy	PCP/ PAHs/ Metals/ TOC	SW-03
SW-4	6/8/15	N. 30.83153 W. 89.11912	Near SD-10 1,500 feet NNW of SW-5	0-1 foot from surface	Sandy, 1.5 feet wide, 0.5 feet deep	PCP/ PAHs/ Metals/ TOC	SW-02
SW-5	6/8/15	N. 30.82672 W. 89.11662	Southern-most sample 1,500 feet E of road	0-1 foot from surface	Sandy, ankle deep	PCP/ PAHs/ Metals/ TOC/	NA

NOTES:

Surface water samples were collected in accordance with "Dirty Hands/Clean Hands" protocol, before sediment sampling
Metals - As, Cr, Cu
PCP - Pentachlorophenol
PAHs - Polycyclic Aromatic Hydrocarbons
TOC - Total Organic Carbon
DUP - Field duplicate sample MS/ MSD - Matrix Spike / Matrix Spike Duplicate EB - Equipment BlankControl

Prepared by: CHT 7/16/15
Checked by: DES 8/5/15

Table 4. Soil Analytical Results
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HWSA Permit No. 980-600-084

Analyte	Units	EPA Table 3 Soil Screening Level	Soil 1 6/9/15	Soil 6 6/9/15 Soil 1 FD	Soil 2 6/9/15	Soil 3 6/9/15	Soil 4 6/9/15	Soil 5 6/9/15
Total Metals								
Arsenic, Total Recoverable	mg/Kg	18	16.3	11.4	3.59	1.48	15.9	6.02
Chromium, Total Recoverable	mg/Kg	28	9.5	7.26	11.7	2.84	36.9	11.2
Copper, Total Recoverable	mg/Kg	28	36.1	24.8	3.65	1.48	17.9	6.75
Semivolatile Organic Compounds								
Pentachlorophenol (PCP)	ug/Kg	2,100	1150	1010	2020	73.8	491	1310
Polycyclic Aromatic Hydrocarbons								
1-Methylnaphthalene	ug/Kg	--	3.46 U	3.6 U	3.48 U	3.3 U	20 U	3.46 U
2-Methylnaphthalene	ug/Kg	--	2.95 U	3.07 U	2.97 U	2.81 U	17.1 U	2.95 U
Acenaphthene	ug/Kg	--	3.98 U	4.13 U	4 U	3.79 U	23 U	3.97 U
Acenaphthylene	ug/Kg	--	9.81 J	3.53 J	2.84 U	2.69 U	16.3 U	4.12 J
Anthracene	ug/Kg	--	27.1	2.14 U	17.4	1.96 U	13.7 J	6.48
Fluorene	ug/Kg	--	3.15 J	2.93 U	2.84 U	2.69 U	16.3 U	2.82 U
Naphthalene	ug/Kg	--	3.98 U	4.13 U	4 U	3.79 U	23 U	3.97 U
Phenanthrene	ug/Kg	--	2.18 U	2.27 U	2.19 U	2.08 U	12.6 U	2.18 U
Total LMW PAHs	ug/Kg	29,000	40.06	3.53	17.4	--	13.7	10.6
Benz(a)anthracene	ug/Kg	--	2.44 U	2.54 U	2.45 U	2.32 U	14.1 U	2.43 U
Benzo(a)pyrene	ug/Kg	--	20.6	15.1	1.29 U	1.23 U	7.41 U	17.5
Benzo(b)fluoranthene	ug/Kg	--	47.5 J	25.1 J	10.8	15.7	82.2	39.6
Benzo(g,h,i)perylene	ug/Kg	--	11.6 J	4.74 J	2.84 U	2.69 U	16.3 U	7.38
Benzo(k)fluoranthene	ug/Kg	--	19.5	13.9	3.1 U	2.93 U	17.8 U	17.4
Chrysene	ug/Kg	--	11	2.54 U	2.45 U	6.31	32.3	16.3
Dibenz(a,h)anthracene	ug/Kg	--	3.46 U	3.6 U	3.48 U	3.3 U	20 U	3.46 U
Fluoranthene	ug/Kg	--	16.9 J	6.03 J	4.14 J	5.74	65.3	14
Indeno(1,2,3-cd)pyrene	ug/Kg	--	12.6 J	5.22 J	2.84 U	2.69 U	16.3 U	7.1
Pyrene	ug/Kg	--	45.8	30.2	4.41 J	6.02	54.8	23
Total HMW PAHs	ug/Kg	1,100	185.5	100.29	19.35	33.77	234.6	142.28
Other Constituents								
Carbon, Total Organic (TOC)	mg/Kg	--	1,920 J	1,100 J	16,000 J	760	14,000	9,990
Solids, Total	%	--	82	80	82	85	71	81

Notes:
Screening levels from Draft EPA Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites
LMW - Low molecular weight
HMW - High molecular weight
FD - Field duplicate
J - Estimated value
U - Undetected at the listed reporting limit
-- - no value or result
Highlighted values exceed screening level

Prepared by: KJG 7/8/15
Reviewed by: LDS 7/9/15

Table 5. Sediment Analytical Results
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSWA Permit No. 980-600-084

Analyte	Units	EPA Table 2a Non-Narcotic Freshwater Screening Values Chronic	EPA Table 2a Non-Narcotic Freshwater Screening Values Acute	EPA Table 2b Narcotic Freshwater Narcosis Screening Values	SD-1 6/9/15	SD-2 6/9/15	SD-3 6/9/15	SD-4 6/9/15	SD-5 6/9/15	SD-6 6/9/15	SD-7 6/9/15	SD-8 6/9/15
Total Metals												
Arsenic, Total Recoverable	mg/Kg	9.8	33	--	5.25	2.13	13.5	1.76	18.8	5.46	0.12 U	1.59
Chromium, Total Recoverable	mg/Kg	43.4	111	--	18.2 U	7.86 U	56.2	3.47 U	56.9	26.5	1.25	7.14
Copper, Total Recoverable	mg/Kg	31.6	149	--	8.84	6.65	42.9	0.99	33.2 J	3.64	0.48 U	2.7
Semivolatile Organic Compounds												
Pentachlorophenol (PCP)	ug/Kg	744	1200	--	63.6	361	1680	52.7	1950	239	18.2 U	119
Polycyclic Aromatic Hydrocarbons												
1-Methylnaphthalene	ug/Kg	--	--	53	4.58 U	3.32 U	7.22 U	3.34 U	5.77 U	2.92 U	3.27 U	8.52 U
2-Methylnaphthalene	ug/Kg	--	--	105	3.9 U	2.83 U	6.15 U	2.85 U	7.99	2.49 U	2.79 U	7.26 U
Acenaphthene	ug/Kg	--	--	378	5.25 U	89.1	8.29 U	3.84 U	6.62 U	3.35 U	3.75 U	9.78 U
Acenaphthylene	ug/Kg	--	--	341	3.73 U	26.5	39	2.72 U	25	2.38 U	2.67 U	6.95 U
Anthracene	ug/Kg	--	--	3.3	2.71 U	185	131	1.98 U	66.8	4.29	1.94 U	5.05 U
Benz(a)anthracene	ug/Kg	--	--	4240	4.77 J	175	41.4	3.37 J	4.06 U	2.06 U	2.3 U	6 U
Benzo(a)pyrene	ug/Kg	--	--	125	14.8	65.5	60.7	1.24 U	31.7	1.08 U	1.21 U	3.16 U
Benzo(b)fluoranthene	ug/Kg	--	--	4361	3.39 U	155	153	2.48 U	71.3	22.4	2.42 U	6.31 U
Benzo(g,h,i)perylene	ug/Kg	--	--	5965	3.73 U	26.6	50.5	2.72 U	20.6	3.06 J	2.67 U	6.95 U
Benzo(k)fluoranthene	ug/Kg	--	--	4069	4.07 U	55.9	49.8	2.97 U	24.8	9.75	2.91 U	7.58 U
Chrysene	ug/Kg	--	--	2551	3.22 U	153	67.2	2.35 U	4.06 U	6	2.3 U	6 U
Dibenz(a,h)anthracene	ug/Kg	--	--	5702	4.58 U	8.11	13.1	3.34 U	5.77 U	2.92 U	3.27 U	8.52 U
Fluoranthene	ug/Kg	--	--	241	3.39 U	895	76.4	2.48 U	52.3	14.1	2.42 U	6.31 U
Fluorene	ug/Kg	--	--	806	3.73 U	55	12.4	2.72 U	10.8	2.38 U	2.67 U	6.95 U
Indeno(1,2,3-cd)pyrene	ug/Kg	--	--	9843	3.73 U	28.4	51.8	2.72 U	20.3	3.54 J	2.67 U	6.95 U
Naphthalene	ug/Kg	--	--	153	5.25 U	3.81 U	16.8	3.84 U	26.8	3.35 U	3.75 U	9.78 U
Phenanthrene	ug/Kg	--	--	384	2.88 U	110	18.5	2.11 U	23	1.84 U	2.06 U	5.37 U
Pyrene	ug/Kg	--	--	790	3.39 U	616	102	2.48 U	61.6	12.6	2.42 U	6.31 U
Other Constituents												
Solids, Total	%	--	--	--	61	77	38	84	49	88	80	65
Carbon, Total Organic (TOC)	mg/Kg	--	--	--	19200	1970	39600	350 J	27700	710	110 U	140 U

Notes:
Screening values from Draft EPA Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites
J - Estimated value
U - Undetected at the listed reporting limit
-- - no value or result
Highlighted values area above screening level(s)

Prepared by: KJG 7/8/15
Reviewed by: LDS 7/9/15

Table 5. Sediment Analytical Results
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSWA Permit No. 980-600-084

Analyte	Units	EPA Table 2a Non-Narcotic Freshwater Screening Values Chronic	EPA Table 2a Non-Narcotic Freshwater Screening Values Acute	EPA Table 2b Narcotic Freshwater Narcosis Screening Values	SD-9 6/9/15	SD-10 6/9/15	SD-11 6/9/15	SD-12 6/9/15 SD-11 FD
Total Metals								
Arsenic, Total Recoverable	mg/Kg	9.8	33	--	1.1	1.53	3.52	3.36
Chromium, Total Recoverable	mg/Kg	43.4	111	--	4.25	4.41	10.1 U	11.4 U
Copper, Total Recoverable	mg/Kg	31.6	149	--	1.35	1.8	4.97	5.85
Semivolatile Organic Compounds								
Pentachlorophenol (PCP)	ug/Kg	744	1200	--	54.8	89.3	256	258
Polycyclic Aromatic Hydrocarbons								
1-Methylnaphthalene	ug/Kg	--	--	53	3.37 U	3.9 U	7.93	5.97 U
2-Methylnaphthalene	ug/Kg	--	--	105	2.87 U	3.32 U	13.5 J	6.36 J
Acenaphthene	ug/Kg	--	--	378	3.87 U	4.47 U	33.5	33.2
Acenaphthylene	ug/Kg	--	--	341	2.75 U	3.18 U	5.85 J	5.31 J
Anthracene	ug/Kg	--	--	3.3	2 U	2.31 U	21.1	21.7
Benz(a)anthracene	ug/Kg	--	--	4240	2.37 U	2.74 U	4.15 U	4.2 U
Benzo(a)pyrene	ug/Kg	--	--	125	1.25 U	1.45 U	2.19 U	2.21 U
Benzo(b)fluoranthene	ug/Kg	--	--	4361	2.5 U	2.89 U	4.37 U	4.42 U
Benzo(g,h,i)perylene	ug/Kg	--	--	5965	2.75 U	3.18 U	4.81 U	4.86 U
Benzo(k)fluoranthene	ug/Kg	--	--	4069	2.99 U	3.47 U	5.25 U	5.31 U
Chrysene	ug/Kg	--	--	2551	2.37 U	2.74 U	4.36 J	4.65 J
Dibenz(a,h)anthracene	ug/Kg	--	--	5702	3.37 U	3.9 U	5.9 U	8.23
Fluoranthene	ug/Kg	--	--	241	2.5 U	3.57 J	63	68.2
Fluorene	ug/Kg	--	--	806	2.75 U	3.18 U	22	21.3
Indeno(1,2,3-cd)pyrene	ug/Kg	--	--	9843	2.75 U	3.18 U	4.81 U	8.3
Naphthalene	ug/Kg	--	--	153	3.87 U	4.47 U	24.5 J	11.2 J
Phenanthrene	ug/Kg	--	--	384	2.12 U	2.46 U	33	28.7
Pyrene	ug/Kg	--	--	790	2.5 U	3.53 J	41.1	43.4
Other Constituents								
Solids, Total	%	--	--	--	78	74	49	48
Carbon, Total Organic (TOC)	mg/Kg	--	--	--	1140	5420	51500	63000

Notes:
Screening values from Draft EPA Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites
J - Estimated value
U - Undetected at the listed reporting limit
-- - no value or result
Highlighted values area above screening level(s)

Prepared by: KJG 7/8/15
Reviewed by: LDS 7/9/15

Table 6. Sediment Analytical Results -
Organic Carbon Normalized
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSW Permit No. 980-600-084

Analyte	EPA Table 2c Organic Carbon Normalized Freshwater Screening Values Narcosis ug/gOC (a)	SD-1 6/9/15 ug/Kg	SD-1 6/9/15 ug/gOC	TU unitless	SD-2 6/9/15 ug/Kg	SD-2 6/9/15 ug/gOC	TU unitless	SD-3 6/9/15 ug/Kg	SD-3 6/9/15 ug/gOC	TU unitless	SD-4 6/9/15 ug/Kg	SD-4 6/9/15 ug/gOC	TU unitless	SD-5 6/9/15 ug/Kg	SD-5 6/9/15 ug/gOC	TU unitless
Polycyclic Aromatic Hydrocarbons																
1-Methylnaphthalene	446	4.58 U	0.24	0.000535	3.32 U	1.69	0.003779	7.22 U	0.18	0.000409	3.34 U	9.54	0.021397	5.77 U	0.21	0.000467
2-Methylnaphthalene	447	3.9 U	0.20	0.000454	2.83 U	1.44	0.003214	6.15 U	0.16	0.000347	2.85 U	8.14	0.018217	7.99	0.29	0.000645
Acenaphthene	491	5.25 U	0.27	0.000557	89.1	45.23	0.092115	8.29 U	0.21	0.000426	3.84 U	10.97	0.022345	6.62 U	0.24	0.000487
Acenaphthylene	452	3.73 U	0.19	0.00043	26.5	13.45	0.029761	39	0.98	0.002179	2.72 U	7.77	0.017193	25	0.90	0.001997
Anthracene	594	2.71 U	0.14	0.000238	185	93.91	0.158095	131	3.31	0.005569	1.98 U	5.66	0.009524	66.8	2.41	0.00406
Benz(a)anthracene	841	4.77 J	0.25	0.000295	175	88.83	0.105627	41.4	1.05	0.001243	3.37 J	9.63	0.011449	4.06 U	0.15	0.000174
Benzo(a)pyrene	965	14.8	0.77	0.000799	65.5	33.25	0.034455	60.7	1.53	0.001588	1.24 U	3.54	0.003671	31.7	1.14	0.001186
Benzo(b)fluoranthene	979	3.39 U	0.18	0.00018	155	78.68	0.080368	153	3.86	0.003947	2.48 U	7.09	0.007238	71.3	2.57	0.002629
Benzo(g,h,i)perylene	1095	3.73 U	0.19	0.000177	26.6	13.50	0.012331	50.5	1.28	0.001165	2.72 U	7.77	0.007097	20.6	0.74	0.000679
Benzo(k)fluoranthene	981	4.07 U	0.21	0.000216	55.9	28.38	0.028925	49.8	1.26	0.001282	2.97 U	8.49	0.00865	24.8	0.90	0.000913
Chrysene	844	3.22 U	0.17	0.000199	153	77.66	0.09202	67.2	1.70	0.002011	2.35 U	6.71	0.007955	4.06 U	0.15	0.000174
Dibenz(a,h)anthracene	1123	4.58 U	0.24	0.000212	8.11	4.12	0.003666	13.1	0.33	0.000295	3.34 U	9.54	0.008498	5.77 U	0.21	0.000185
Fluoranthene	707	3.39 U	0.18	0.00025	895	454.31	0.642595	76.4	1.93	0.002729	2.48 U	7.09	0.010022	52.3	1.89	0.002671
Fluorene	538	3.73 U	0.19	0.000361	55	27.92	0.051894	12.4	0.31	0.000582	2.72 U	7.77	0.014445	10.8	0.39	0.000725
Indeno(1,2,3-cd)pyrene	1115	3.73 U	0.19	0.000174	28.4	14.42	0.012929	51.8	1.31	0.001173	2.72 U	7.77	0.00697	20.3	0.73	0.000657
Naphthalene	385	5.25 U	0.27	0.00071	3.81 U	1.93	0.005023	16.8	0.42	0.001102	3.84 U	10.97	0.028497	26.8	0.97	0.002513
Phenanthrene	596	2.88 U	0.15	0.000252	110	55.84	0.093687	18.5	0.47	0.000784	2.11 U	6.03	0.010115	23	0.83	0.001393
Pyrene	697	3.39 U	0.18	0.000253	616	312.69	0.448623	102	2.58	0.003695	2.48 U	7.09	0.010166	61.6	2.22	0.003191
ESBTU	1			0.006293			1.899107			0.030526			0.223449			0.024745
ESBTU*11.5 (max adustedj)	1			0.07237			21.83973			0.351046			2.569666			0.284571
ESBTU*1.64 (min adjusted)	1			0.010321			3.114536			0.050062			0.366457			0.040582
Other Constituents																
Solids, Total - %	--	61	61		77	77		38	38		84	84		49	49	
Total Organic Carbon (TOC) - mg/Kg	--	19,200	19,200		1,970	1,970		39,600	39,600		350 J	350		27,700	27,700	
Total Organic Carbon (TOC) - %	--	1.92	1.92		0.197	0.197		3.96	3.96		0.035 J	0.035		2.77	2.77	

Notes:
Screening values from Draft EPA Region 4
Ecological Technical Advisory Group Sediment
(a) - Listed values are in ug/gOC, not ug/Kg as listed on EPA Table 2b
FD - Field duplicate
J - Estimated value
U - Undetected at the listed reporting limit
-- - no listed screening value
TU - toxic unit, unitless
ESBTU - Equilibrium Sediment Benchmark Toxic Units, unitless, based on 34 PAHs
ESBTU*11.5 - adjustment based on 13 PAHs
ESBTU*1.64 - adjustment based on 23 PAHs
ug/gOC - micrograms analyte/gram organic carbon
Blue values are calculated
Yellow highlighted values above ESBTU of 1
Red highlighted TOC is <0.1%
Purple highlighted TOC is <1%

Prepared by: KJG 7/8/15
Reviewed by: LDS 7/9/15; DES 7/16/15

Table 6. Sediment Analytical Results -
Organic Carbon Normalized
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSW Permit No. 980-600-084

Analyte	EPA Table 2c Organic Carbon Normalized Freshwater Screening Values Narcosis ug/gOC (a)	SD-6 6/9/15 ug/Kg	SD-6 6/9/15 ug/gOC	TU unitless	SD-7 6/9/15 ug/Kg	SD-7 6/9/15 ug/gOC	TU unitless	SD-8 6/9/15 ug/Kg	SD-8 6/9/15 ug/gOC	TU unitless	SD-9 6/9/15 ug/Kg	SD-9 6/9/15 ug/gOC	TU unitless	SD-10 6/9/15 ug/Kg	SD-10 6/9/15 ug/gOC	TU unitless
Polycyclic Aromatic Hydrocarbons																
1-Methylnaphthalene	446	2.92 U	4.11	0.009221	3.27 U	29.73	0.066653	8.52 U	60.86	0.136451	3.37 U	2.96	0.006628	3.9 U	0.72	0.001613
2-Methylnaphthalene	447	2.49 U	3.51	0.007846	2.79 U	25.36	0.056742	7.26 U	51.86	0.116012	2.87 U	2.52	0.005632	3.32 U	0.61	0.00137
Acenaphthene	491	3.35 U	4.72	0.00961	3.75 U	34.09	0.069432	9.78 U	69.86	0.142275	3.87 U	3.39	0.006914	4.47 U	0.82	0.00168
Acenaphthylene	452	2.38 U	3.35	0.007416	2.67 U	24.27	0.053701	6.95 U	49.64	0.109829	2.75 U	2.41	0.005337	3.18 U	0.59	0.001298
Anthracene	594	4.29	6.04	0.010172	1.94 U	17.64	0.029691	5.05 U	36.07	0.060726	2 U	1.75	0.002954	2.31 U	0.43	0.000718
Benz(a)anthracene	841	2.06 U	2.90	0.00345	2.3 U	20.91	0.024862	6 U	42.86	0.05096	2.37 U	2.08	0.002472	2.74 U	0.51	0.000601
Benzo(a)pyrene	965	1.08 U	1.52	0.001576	1.21 U	11.00	0.011399	3.16 U	22.57	0.02339	1.25 U	1.10	0.001136	1.45 U	0.27	0.000277
Benzo(b)fluoranthene	979	22.4	31.55	0.032226	2.42 U	22.00	0.022472	6.31 U	45.07	0.046038	2.5 U	2.19	0.00224	2.89 U	0.53	0.000545
Benzo(g,h,i)perylene	1095	3.06 J	4.31	0.003936	2.67 U	24.27	0.022167	6.95 U	49.64	0.045336	2.75 U	2.41	0.002203	3.18 U	0.59	0.000536
Benzo(k)fluoranthene	981	9.75	13.73	0.013998	2.91 U	26.45	0.026967	7.58 U	54.14	0.055191	2.99 U	2.62	0.002674	3.47 U	0.64	0.000653
Chrysene	844	6	8.45	0.010013	2.3 U	20.91	0.024774	6 U	42.86	0.050779	2.37 U	2.08	0.002463	2.74 U	0.51	0.000599
Dibenz(a,h)anthracene	1123	2.92 U	4.11	0.003662	3.27 U	29.73	0.026471	8.52 U	60.86	0.054192	3.37 U	2.96	0.002632	3.9 U	0.72	0.000641
Fluoranthene	707	14.1	19.86	0.028089	2.42 U	22.00	0.031117	6.31 U	45.07	0.06375	2.5 U	2.19	0.003102	3.57 J	0.66	0.000932
Fluorene	538	2.38 U	3.35	0.006231	2.67 U	24.27	0.045117	6.95 U	49.64	0.092273	2.75 U	2.41	0.004484	3.18 U	0.59	0.001091
Indeno(1,2,3-cd)pyrene	1115	3.54 J	4.99	0.004472	2.67 U	24.27	0.021769	6.95 U	49.64	0.044523	2.75 U	2.41	0.002163	3.18 U	0.59	0.000526
Naphthalene	385	3.35 U	4.72	0.012255	3.75 U	34.09	0.088548	9.78 U	69.86	0.181447	3.87 U	3.39	0.008817	4.47 U	0.82	0.002142
Phenanthrene	596	1.84 U	2.59	0.004348	2.06 U	18.73	0.031422	5.37 U	38.36	0.064358	2.12 U	1.86	0.00312	2.46 U	0.45	0.000762
Pyrene	697	12.6	17.75	0.025461	2.42 U	22.00	0.031564	6.31 U	45.07	0.064665	2.5 U	2.19	0.003146	3.53 J	0.65	0.000934
ESBTU	1			0.193983			0.684867			1.402195			0.068118			0.016917
ESBTU*11.5 (max adustedj)	1			2.230803			7.875966			16.12524			0.783358			0.194541
ESBTU*1.64 (min adjusted)	1			0.318132			1.123181			2.299599			0.111714			0.027743
Other Constituents																
Solids, Total - %	--	88	88		80	80		65	65		78	78		74	74	
Total Organic Carbon (TOC) - mg/Kg	--	710	710		110 U	110		140 U	140		1,140	1,140		5,420	5,420	
Total Organic Carbon (TOC) - %	--	0.071	0.071		0.011 U	0.011		0.014 U	0.014		0.114	0.114		0.542	0.542	

Notes:
Screening values from Draft EPA Region 4
Ecological Technical Advisory Group Sediment
(a) - Listed values are in ug/gOC, not ug/Kg as listed on EPA Table 2b
FD - Field duplicate
J - Estimated value
U - Undetected at the listed reporting limit
-- - no listed screening value
TU - toxic unit, unitless
ESBTU - Equilibrium Sediment Benchmark Toxic Units, unitless, based on 34 PAHs
ESBTU*11.5 - adjustment based on 13 PAHs
ESBTU*1.64 - adjustment based on 23 PAHs
ug/gOC - micrograms analyte/gram organic carbon
Blue values are calculated
Yellow highlighted values above ESBTU of 1
Red highlighted TOC is <0.1%
Purple highlighted TOC is <1%

Prepared by: KJG 7/8/15
Reviewed by: LDS 7/9/15; DES 7/16/15

Table 6. Sediment Analytical Results -
Organic Carbon Normalized
Supplemental CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA HSW Permit No. 980-600-084

Analyte	EPA Table 2c Organic Carbon Normalized Freshwater Screening Values Narcosis ug/gOC (a)	SD-11 6/9/15 ug/Kg		SD-11 6/9/15 ug/gOC	TU unitless	SD-11 FD SD-12 6/9/15 ug/Kg		SD-11 FD SD-12 6/9/15 ug/gOC	TU unitless
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	446	7.93		0.15	0.000345	5.97	U	0.09	0.000212
2-Methylnaphthalene	447	13.5	J	0.26	0.000586	6.36	J	0.10	0.000226
Acenaphthene	491	33.5		0.65	0.001325	33.2		0.53	0.001073
Acenaphthylene	452	5.85	J	0.11	0.000251	5.31	J	0.08	0.000186
Anthracene	594	21.1		0.41	0.00069	21.7		0.34	0.00058
Benz(a)anthracene	841	4.15	U	0.08	9.58E-05	4.2	U	0.07	7.93E-05
Benzo(a)pyrene	965	2.19	U	0.04	4.41E-05	2.21	U	0.04	3.64E-05
Benzo(b)fluoranthene	979	4.37	U	0.08	8.67E-05	4.42	U	0.07	7.17E-05
Benzo(g,h,i)perylene	1095	4.81	U	0.09	8.53E-05	4.86	U	0.08	7.05E-05
Benzo(k)fluoranthene	981	5.25	U	0.00	1.14E-06	5.31	U	0.08	8.59E-05
Chrysene	844	4.36	J	0.08	0.0001	4.65	J	0.07	8.75E-05
Dibenz(a,h)anthracene	1123	5.9	U	0.11	0.000102	8.23		0.13	0.000116
Fluoranthene	707	63		1.22	0.00173	68.2		1.08	0.001531
Fluorene	538	22		0.43	0.000794	21.3		0.34	0.000628
Indeno(1,2,3-cd)pyrene	1115	4.81	U	0.09	8.38E-05	8.3		0.13	0.000118
Naphthalene	385	24.5	J	0.48	0.001236	11.2	J	0.18	0.000462
Phenanthrene	596	33		0.64	0.001075	28.7		0.46	0.000764
Pyrene	697	41.1		0.80	0.001145	43.4		0.69	0.000988
ESBTU	1				0.009777				0.007318
ESBTU*11.5 (max adustedj)	1				0.112432				0.084153
ESBTU*1.64 (min adjusted)	1				0.016034				0.012001
Other Constituents									
Solids, Total - %	--	49		49		48		48	
Total Organic Carbon (TOC) - mg/Kg	--	51,500		51,500		63,000		63,000	
Total Organic Carbon (TOC) - %	--	5.15		5.15		6.3		6.3	

Notes:
Screening values from Draft EPA Region 4
Ecological Technical Advisory Group Sediment
(a) - Listed values are in ugOC, not ug/Kg as listed on EPA Table 2b
FD - Field duplicate
J - Estimated value
U - Undetected at the listed reporting limit
-- - no listed screening value
TU - toxic unit, unitless
ESBTU - Equilibrium Sediment Benchmark Toxic Units, unitless, based on 34 PAHs
ESBTU*11.5 - adjustment based on 13 PAHs
ESBTU*1.64 - adjustment based on 23 PAHs
ug/gOC - micrograms analyte/gram organic carbon
Blue values are calculated
Yellow highlighted values above ESBTU of 1
Red highlighted TOC is <0.1%
Purple highlighted TOC is <1%

Prepared by: KJG 7/8/15
Reviewed by: LDS 7/9/15; DES 7/16/15

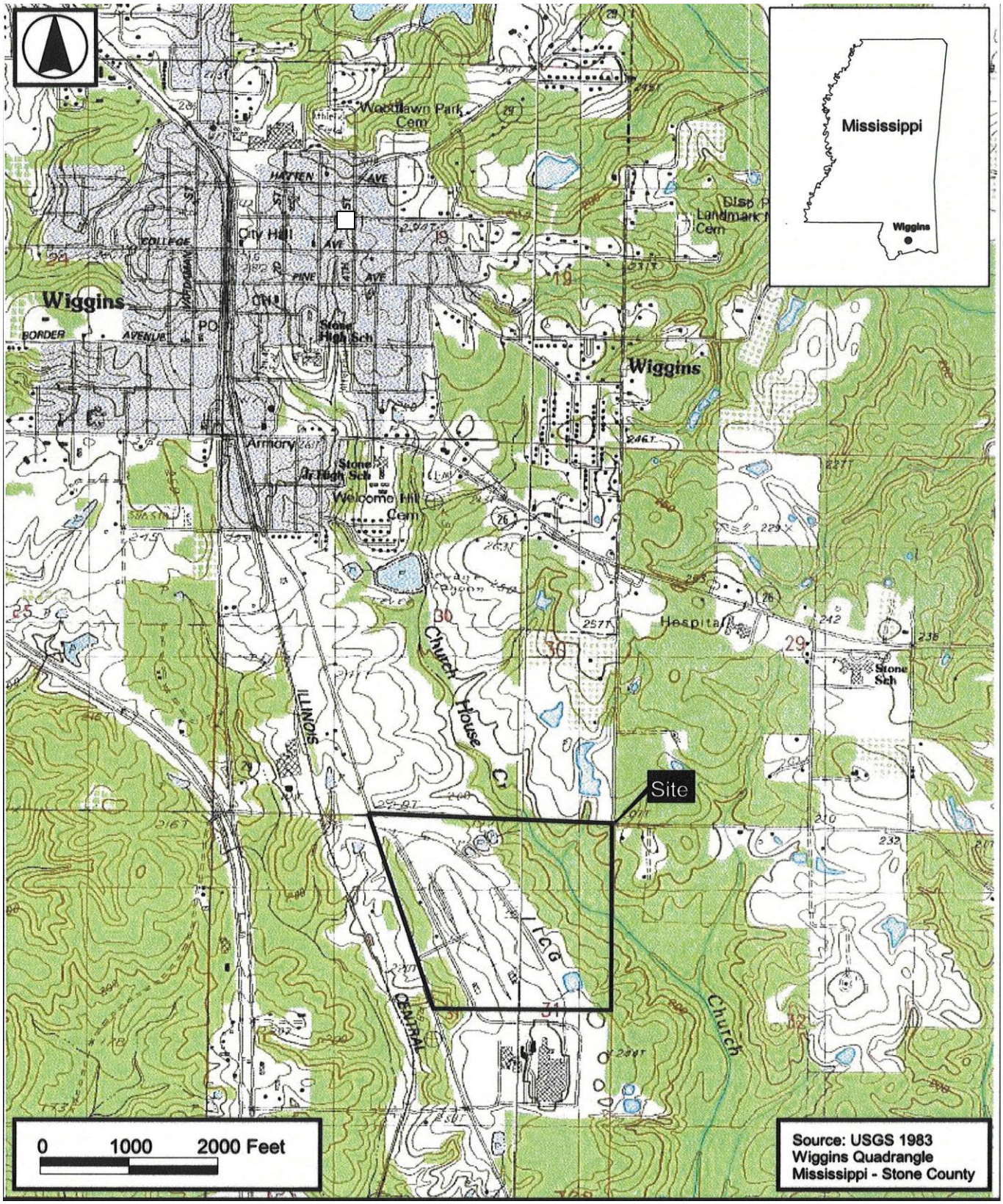
Table 7. Surface Water Analytical Results
Supplemental CMS
International Paper
Closed Former Wood Treaing Units, Wiggins, MS
EPA HSWA Permit No. 980-600-084

Analyte	Units	EPA Table 1a Freshwater Screening Values Chronic	Acute	SW-1 6/8/15	SW-2 6/8/15	SW-6 6/8/15 SW-2 FD	SW-3 6/8/15	SW-4 6/8/15	SW-5 6/8/15
Total Metals									
Arsenic, Total Recoverable	ug/L	150	340	1.1	49.2 J	32.1 J	43.1	2.4	4.9
Chromium, Total Recoverable	ug/L	74	570	3.2	114 J	63.7 J	10.8	1.2	1.7
Copper, Total Recoverable	ug/L	9	13	1.4	83.5 J	46.2 J	7.2	0.3 U	1 J
Calcium, Total Recoverable	mg/L	116	--	2.75	7.83 J	5.47 J	7.94	1.1	2.28
Magnesium, Total Recoverable	mg/L	82	--	0.81	2.61 J	1.78 J	1.61	0.26	0.51
Semivolatile Organic Compounds									
Pentachlorophenol (PCP)	ug/L	15	19	0.039 U	1.4	1.42	1.27	0.039 U	0.039 U
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	ug/L	2.1	37	0.044 U	0.0474 U	0.0474 U	0.044 U	0.044 U	0.044 U
2-Methylnaphthalene	ug/L	4.7	42	0.044 U	0.0474 U	0.0474 U	0.044 U	0.044 U	0.044 U
Acenaphthene	ug/L	15	19	0.041 U	0.0441 U	0.0441 U	0.041 U	0.041 U	0.041 U
Acenaphthylene	ug/L	13	120	0.025 U	0.0269 U	0.0269 U	0.025 U	0.025 U	0.025 U
Anthracene	ug/L	0.02	0.18	0.038 U	0.0409 U	0.0445 J	0.13	0.038 U	0.038 U
Benz(a)anthracene	ug/L	4.7	42	0.035 U	0.0377 U	0.0377 U	0.035 U	0.035 U	0.035 U
Benzo(a)pyrene	ug/L	0.06	0.54	0.031 U	0.0334 U	0.0334 U	0.031 U	0.031 U	0.031 U
Benzo(b)fluoranthene	ug/L	2.6	23	0.025 U	0.0269 U	0.0269 U	0.025 U	0.025 U	0.025 U
Benzo(g,h,i)perylene	ug/L	0.44	6	0.039 U	0.042 U	0.042 U	0.039 U	0.039 U	0.039 U
Benzo(k)fluoranthene	ug/L	0.64	4	0.035 U	0.0377 U	0.0377 U	0.035 U	0.035 U	0.035 U
Chrysene	ug/L	4.7	42	0.024 U	0.0259 U	0.0259 U	0.024 U	0.024 U	0.024 U
Dibenz(a,h)anthracene	ug/L	0.28	6	0.036 U	0.0388 U	0.0388 U	0.036 U	0.036 U	0.036 U
Fluoranthene	ug/L	0.8	3.7	0.039 U	0.042 U	0.042 U	0.039 U	0.039 U	0.039 U
Fluorene	ug/L	19	110	0.047 U	0.0506 U	0.0506 U	0.047 U	0.047 U	0.047 U
Indeno(1,2,3-cd)pyrene	ug/L	0.28	6	0.04 U	0.0431 U	0.0431 U	0.04 U	0.04 U	0.04 U
Naphthalene	ug/L	21	170	0.039 U	0.042 U	0.042 U	0.039 U	0.039 U	0.039 U
Phenanthrene	ug/L	2.3	31	0.035 U	0.0377 U	0.0377 U	0.035 U	0.035 U	0.035 U
Pyrene	ug/L	4.6	42	0.031 U	0.0334 U	0.0334 U	0.031 U	0.031 U	0.031 U
Other Constituents									
Hardness, Total as CaCO3	mg/L	--	--	10.2	30.3 J	21 J	26.5	3.8	7.8
Carbon, Total Organic (TOC)	mg/L	--	--	--	--	--	--	--	--

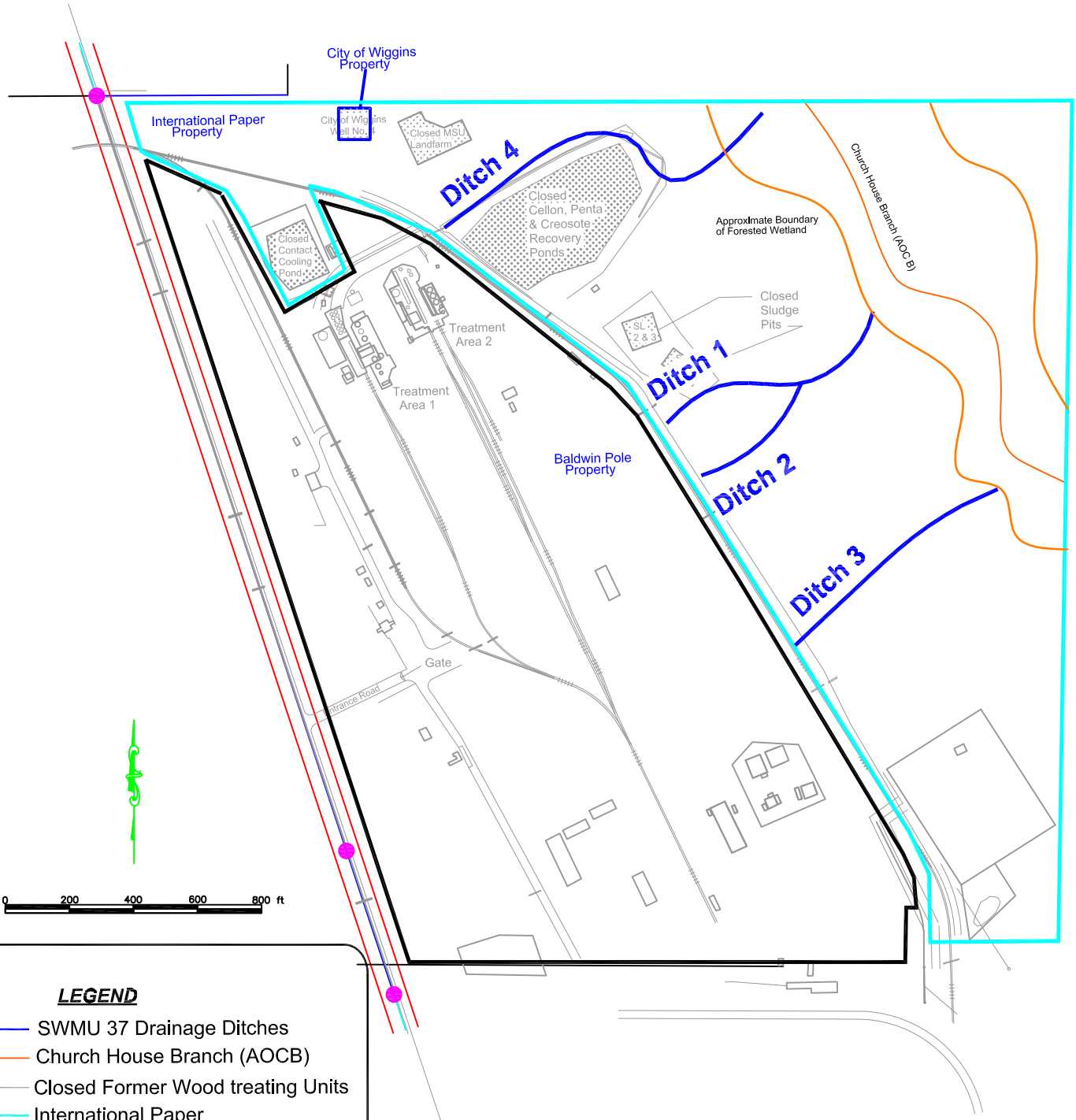
Notes:
Screening values from Draft EPA Region 4 Surface Water Screening Values for Hazardous Waste Sites
FD - Field duplicate
J - Estimated value
U - Undetected at the listed reporting limit
-- - no value or result
Highlighted values are above screening value(s)

Prepared by: KJG 7/8/15
Reviewed by: LDS 7/9/15

FIGURES



INTERNATIONAL PAPER Closed Former Wood Treating Units Wiggins, Mississippi	EARTHCON®	Figure 1 Site Location Map



International Paper
Closed Former Wood Treating Units
Wiggins, MS

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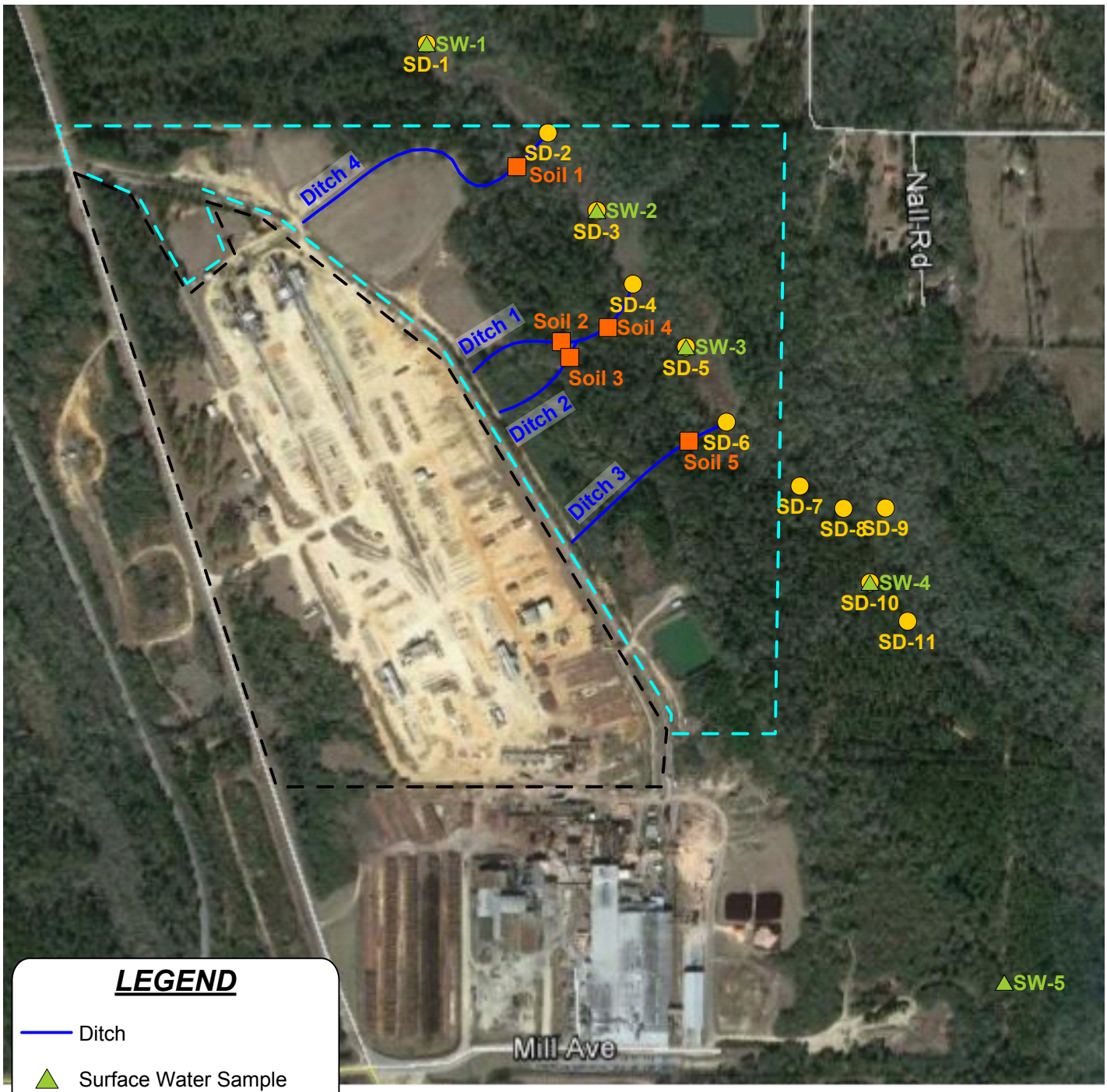
Corrective Action Units

DESIGNED: CHT	CHECKED: DS	DATE: July 22, 2015	FIGURE NO. FIGURE 2
DRAWN: CHT			



LEGEND

- Ditch
- Surface Water Sample
- Sediment Sample
- Soil Sample
- International Paper Property Boundary
- Baldwin Pole Mississippi Property Boundary

Note:
Location of SD-10 is approximate location of former SD-03
Location of SD-9 is approximate location of former SD-04
Location of SD-8 is approximate location of former SD-05

N
W E
S

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International Paper
Closed Former Wood TreatingUnits
Wiggins, MS

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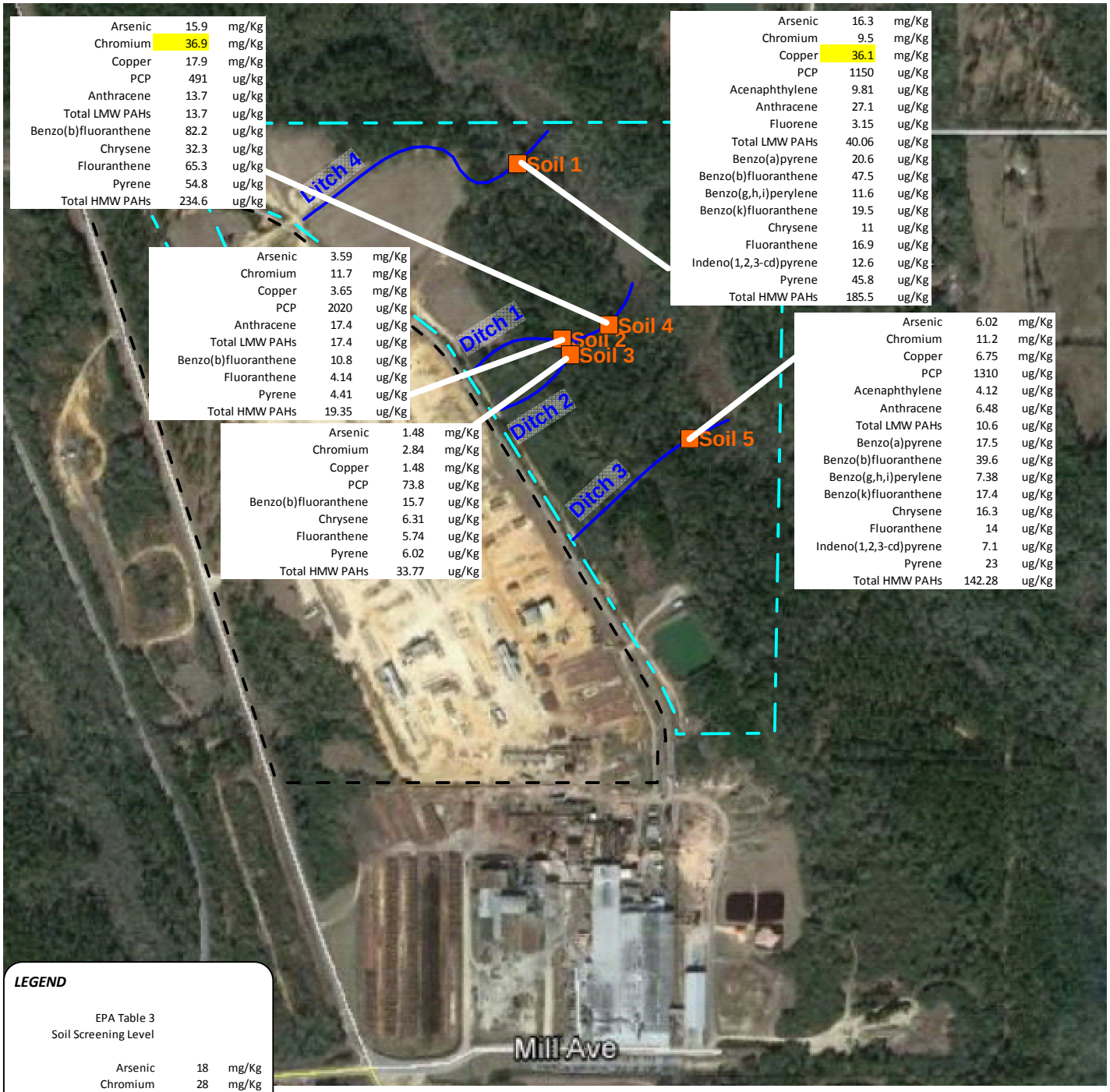
Sampling Locations

DESIGNED: DCW	CHECKED: DS	DATE: May 15, 2015	FIGURE NO. Figure 3
DRAWN: DCW			



Arsenic	15.9	mg/Kg
Chromium	36.9	mg/Kg
Copper	17.9	mg/Kg
PCP	491	ug/kg
Anthracene	13.7	ug/kg
Total LMW PAHs	13.7	ug/kg
Benzo(b)fluoranthene	82.2	ug/kg
Chrysene	32.3	ug/kg
Flouranthene	65.3	ug/kg
Pyrene	54.8	ug/kg
Total HMW PAHs	234.6	ug/kg

Arsenic	16.3	mg/Kg
Chromium	9.5	mg/Kg
Copper	36.1	mg/Kg
PCP	1150	ug/Kg
Acenaphthylene	9.81	ug/Kg
Anthracene	27.1	ug/Kg
Fluorene	3.15	ug/Kg
Total LMW PAHs	40.06	ug/Kg
Benzo(a)pyrene	20.6	ug/Kg
Benzo(b)fluoranthene	47.5	ug/Kg
Benzo(g,h,i)perylene	11.6	ug/Kg
Benzo(k)fluoranthene	19.5	ug/Kg
Chrysene	11	ug/Kg
Fluoranthene	16.9	ug/Kg
Indeno(1,2,3-cd)pyrene	12.6	ug/Kg
Pyrene	45.8	ug/Kg
Total HMW PAHs	185.5	ug/Kg

Arsenic	3.59	mg/Kg
Chromium	11.7	mg/Kg
Copper	3.65	mg/Kg
PCP	2020	ug/Kg
Anthracene	17.4	ug/Kg
Total LMW PAHs	17.4	ug/Kg
Benzo(b)fluoranthene	10.8	ug/Kg
Fluoranthene	4.14	ug/Kg
Pyrene	4.41	ug/Kg
Total HMW PAHs	19.35	ug/Kg

Arsenic	1.48	mg/Kg
Chromium	2.84	mg/Kg
Copper	1.48	mg/Kg
PCP	73.8	ug/Kg
Benzo(b)fluoranthene	15.7	ug/Kg
Chrysene	6.31	ug/Kg
Fluoranthene	5.74	ug/Kg
Pyrene	6.02	ug/Kg
Total HMW PAHs	33.77	ug/Kg

Arsenic	6.02	mg/Kg
Chromium	11.2	mg/Kg
Copper	6.75	mg/Kg
PCP	1310	ug/Kg
Acenaphthylene	4.12	ug/Kg
Anthracene	6.48	ug/Kg
Total LMW PAHs	10.6	ug/Kg
Benzo(a)pyrene	17.5	ug/Kg
Benzo(b)fluoranthene	39.6	ug/Kg
Benzo(g,h,i)perylene	7.38	ug/Kg
Benzo(k)fluoranthene	17.4	ug/Kg
Chrysene	16.3	ug/Kg
Fluoranthene	14	ug/Kg
Indeno(1,2,3-cd)pyrene	7.1	ug/Kg
Pyrene	23	ug/Kg
Total HMW PAHs	142.28	ug/Kg

LEGEND

EPA Table 3 Soil Screening Level		
Arsenic	18	mg/Kg
Chromium	28	mg/Kg
Copper	28	mg/Kg
PCP	2,100	ug/Kg
Acenaphthylene	--	ug/Kg
Anthracene	--	ug/Kg
Fluorene	--	ug/Kg
Total LMW PAHs	29,000	ug/Kg
Benzo(a)pyrene	--	ug/Kg
Benzo(b)fluoranthene	--	ug/Kg
Benzo(g,h,i)perylene	--	ug/Kg
Benzo(k)fluoranthene	--	ug/Kg
Chrysene	--	ug/Kg
Fluoranthene	--	ug/Kg
Indeno(1,2,3-cd)pyrene	--	ug/Kg
Pyrene	--	ug/Kg

Highlighted values exceed screening level

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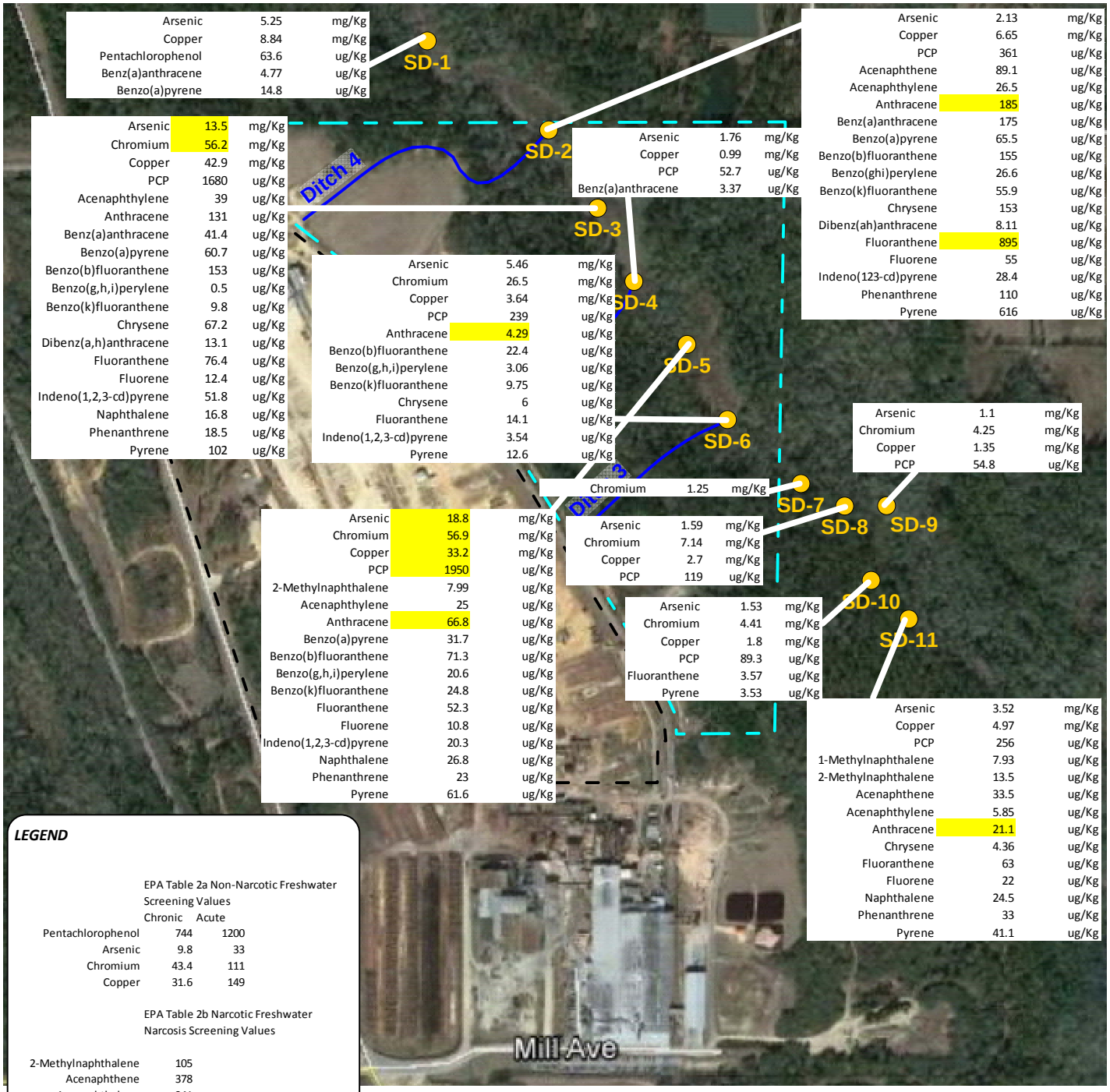
Detected Soil Results

DESIGNED:	CHECKED:	DATE:	
CHT	DS	July 21, 2015	Figure 4
DRAWN: CHT			



LEGEND

EPA Table 2a Non-Narcotic Freshwater Screening Values

	Chronic	Acute
Pentachlorophenol	744	1200
Arsenic	9.8	33
Chromium	43.4	111
Copper	31.6	149

EPA Table 2b Narcotic Freshwater Narcosis Screening Values

2-Methylnaphthalene	105
Acenaphthene	378
Acenaphthylene	341
Anthracene	3.3
Benz(a)anthracene	4240
Benzo(a)pyrene	125
Benzo(b)fluoranthene	4361
Benzo(g,h,i)perylene	5965
Benzo(k)fluoranthene	4069
Chrysene	2551
Dibenz(a,h)anthracene	5702
Fluoranthene	241
Fluorene	806
Indeno(1,2,3-cd)pyrene	9843
Naphthalene	153
Phenanthrene	384
Pyrene	790

Highlighted values exceed screening values

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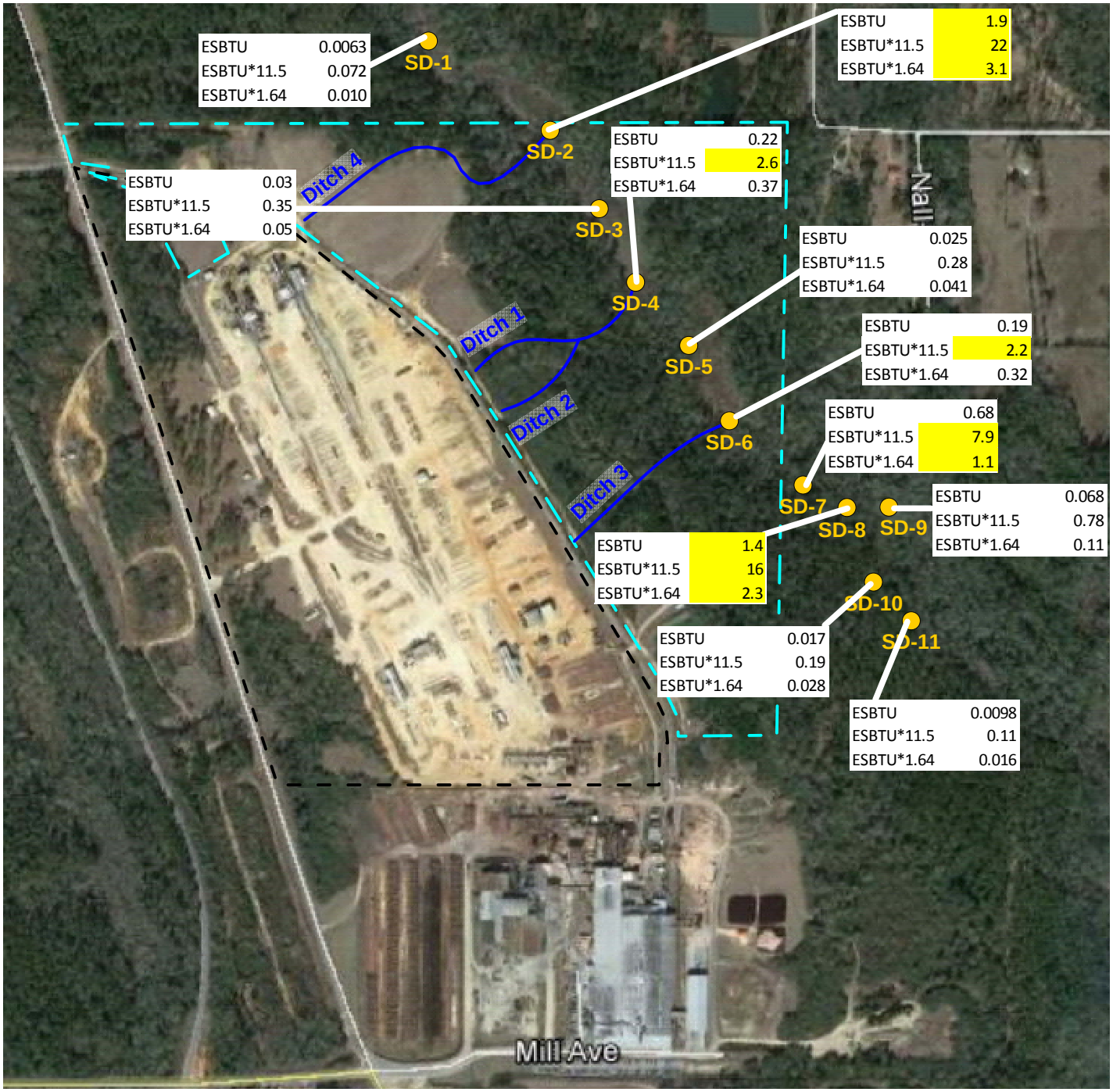
Detected Sediment Results

DESIGNED:	CHECKED:	DATE:	FIGURE NO.
CHT	DS	July 21, 2015	Figure 5
DRAWN: CHT			



LEGEND

Organic Carbon Normalized Screening Level

ESBTU	1
ESBTU*11.5	1
ESBTU*1.64	1

Highlighted values exceed screening values

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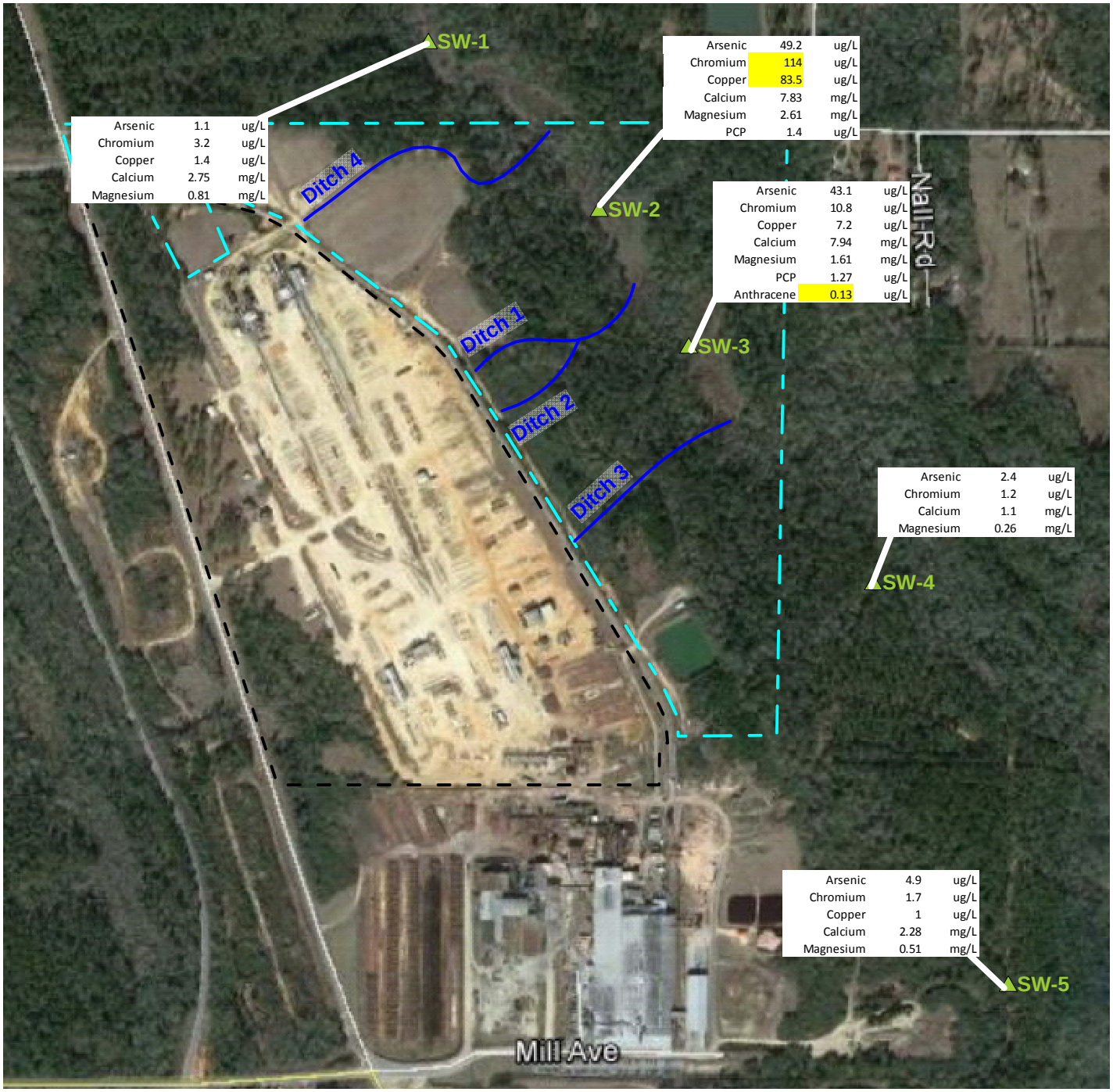
Sediment ESBTU Results

DESIGNED:	CHECKED:	DATE:	FIGURE NO.
CHT	DS	July 21, 2015	Figure 6
DRAWN: CHT			



LEGEND

EPA Table 1a Freshwater Screening Values

	Chronic	Acute	Units
Arsenic	150	340	ug/L
Chromium	74	570	ug/L
Copper	9	13	ug/L
Calcium	116	--	mg/L
Magnesium	82	--	mg/L
PCP	15	19	ug/L
Anthracene	0.02	0.18	ug/L

Highlighted values exceed screening values

INTERNATIONAL PAPER

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Detected Surface Water Results

DESIGNED: CHT	CHECKED: DS	DATE: July 21, 2015	Figure 7
DRAWN: CHT			

APPENDICES

Appendix A
Supplemental CMS Field Sampling Plan

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Environmental Challenges
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F: 866-263-0098
www.earthcon.com

MEMORANDUM

TO: Doug McCurry, Brett Thomas, EPA Region 4

FROM: Doug Seely, Norm Kennel, PG, EarthCon

DATE: May 21, 2015

SUBJECT: Supplemental CMS Field Sampling Plan –
SMWU 37 Drainage Ditches & AOC B Church House Branch
International Paper
Former Wood Treating Units
Wiggins, MS
EPA ID No. MSD 980 600 084

CC: Brent Sasser, International Paper

This memorandum and the attached documents were prepared to provide U.S. Environmental Protection Agency Region 4 (EPA) with a Field Sampling Plan for the supplemental evaluation of one Solid Waste Management Unit (SWMU) and one Area of Concern (AOC) at the International Paper (IP) Former Wood Treating Units in Wiggins, MS (the Site). The sampling locations, number of samples, sample type, and laboratory analyses were agreed upon by EPA and International Paper (IP) during a site visit on April 30, 2015. The intent of the work plan is to present a "streamlined" sampling plan that will be used for a screening level ecological risk assessment.

The AOC to be evaluated is AOC B Church House Branch and the SWMU is SMWU 37 Drainage Ditches. Resampling these two locations will be conducted by EarthCon Consultants, Inc. (EarthCon) on behalf of IP in support of finalizing the Corrective Measures Study (CMS) and to reach a decision on a final remedy for these two SWMUs in conjunction with the HSWA Permit renewal. This Field Sampling Plan will be promptly implemented upon EPA approval.

BACKGROUND

IP submitted a Preliminary CMS Report to EPA in October 2005, The Preliminary CMS was conducted in accordance with a CMS Work Plan prepared for IP in June 2004 that was approved by EPA. In addition, IP submitted a Dioxin Soil Sampling Report to EPA in 2008 that included the analytical results for soil samples analyzed for Dioxin from the SWMU 37 Drainage Ditches. EPA reviewed these reports between 2012 and 2014, and provided comments to IP in July 2014. EPA, IP and EarthCon met at the Site on July 22, 2014 to discuss the EPA's review comments. As a result of this discussion, EPA requested that IP collect and analyze additional soil, sediment and surface water samples from SWMU 37 and AOC B and update the environmental risk screening to bring the CMS conclusions up-to-date.

EPA, IP and EarthCon conducted a Site Visit on April 30, 2015 to discuss the specifics of the additional field sampling to be conducted. The scope of this Field Sampling Plan was developed in accordance with the scoping decisions reached at the Site Visit. The sample collection, analysis and ecological risk screening methods proposed by IP are provided in this Field Sampling Plan.

SAMPLE COLLECTION

Soil samples will be collected from the SWMU 37 Drainage Ditches at locations consistent with prior sampling conducted in 2005 (Ditches 1,2 and 3), as well at one additional drainage ditch location (Ditch 4) requested by EPA. These locations are shown on **Figure 1** and the sample collection details are summarized below and in **Table 4 Sampling Plan**. Samples locations are intended to approximate prior sampling locations from the 2005 sampling and/or to assess locations requested by EPA due to their proximity to the various Drainage Ditch discharge points into the Church House Branch.

Surface Water

Surface water samples will be collected using a "Clean Hands/Dirty Hands" approach (this is a method upgrade that is consistent with the attached **SOP 401** from the 2004 CMS Work Plan). The person handling the sample bottle before, during and immediately after sample collection will be the "Clean Hands" sampler and will wear nitrile gloves and avoid touching or handling other equipment or materials while sampling. The "Clean Hands" sampler will submerge the sample bottle in the top 0 to 1 foot of standing water at each sampling point for sample collection. The sample bottle will be filled and drained twice before retaining the third sample, thus rinsing the bottle interior with sample. The "Dirty Hands" sampler will handle any sampling equipment, the sample cooler, and record notes in the field notebook (see the attached **SOP 003** from the 2004 CMS Work Plan). In order to implement the "Clean Hands/Dirty Hands" method, the surface water samples will all be collected prior to the collection of sediment or soil samples. In addition, surface water sampling will start at the furthest downstream location and work sequentially upstream.

Soil and Sediment Samples

Soil samples and sediment samples will be collected from depths of 0 to 0.5 feet from the soil or sediment surface. Soil samples will be collected using a stainless steel (SS) trowel (consistent with the attached **SOP 201** from the 2004 CMS Work Plan). Sediment samples will be collected using methods appropriate for the water depth at each point (see the attached **SOP 430** from the 2004 CMS Work Plan). Based on the site visit on April 30, 2015, the sediment is largely sandy and not well suited to collection using a coring device. Therefore, it is planned that most samples will be collected using a SS trowel or shovel. The collected samples will be mixed in a SS bowl to facilitate collection of a sample representative of the 0–0.5 foot sample depth. Sediment sampling in the Church House Branch will start at the furthest downstream location and work sequentially upstream. No specific sampling sequence is needed for the soil sampling in the Drainage Ditches.

All Samples

All samples will be collected in laboratory-cleaned containers and placed on ice immediately after sample collection. Sample bottles will be labeled and packed in bubble-wrap and ice in coolers for overnight shipment to the analytical laboratory, ALS, Jacksonville, FL (see the attached **SOP 002** from the 2004 CMS Work Plan). A chain-of-custody sheet will accompany each cooler when shipped (see the attached **SOP 001** from the 2004 CMS Work Plan). Sampling equipment (i.e., SS trowel, shovel, SS mixing bowl, etc.) will be cleaned and decontaminated between sample locations using Alconox, tap water, isopropanol, 0.1 Normal nitric acid, and distilled water rinses (see the attached **SOP 004** from the 2004 CMS Work Plan). Due to the site conditions and limited access to sample locations decontamination solvents will be applied with spray bottles only instead of by immersion in plastic tubs. Due to the small volumes used for decontamination and the remoteness of sample locations, decontamination fluids will not be contained and will be allowed to drain to the ground surface. Excess sample not placed into sample bottles will also be left at the sample location.

Pertinent field sampling information will be documented on the sample bottle label. This and other relevant sample information will also be recorded in a field logbook. Sample locations will be marked in the field with wooden stakes with fluorescent survey tape. Survey tape will also be placed on a nearby tree trunk, branch or bush. Survey tape may also be used to mark the path by which the sampling crew accesses particular sample locations. A portable GPS unit will be used to collect latitude and longitude data for each location to facilitate the placement of actual sample locations on a final figure in the report of results.

SAMPLE ANALYSIS

The collected samples will be analyzed for parameters related to the wood treatment chemicals associated with the Closed Former Wood Treating Units as well as the ongoing wood treatment at the Baldwin Pole Mississippi LLC facility. The proposed parameters for this event consider the analytical results and environmental risk screening in the 2005 Preliminary CMS Report eliminating parameters that were deemed to pose insignificant risk. The proposed analytical methods are listed in **Table 5** and include Pentachlorophenol, seventeen Polycyclic Aromatic Hydrocarbons (PAHs), Arsenic (As), Copper (Cu) Chromium (Cr), Hardness (surface water only), Total Organic Carbon (soil and sediment), and grain size (soil and sediment). Based on the 2005 CMS Report results, analytical parameters not included for this event include Volatile Organic Compounds (VOCs), Polychlorinated Biphenyls (PCBs), Pesticides/Herbicides, non-PAH Semivolatile Organic Compounds (SVOCs), Cyanide, a number of other metals, and a number of other general chemical analytes. Based on Site Visit discussions with EPA, Dioxin analysis is also not needed for this event. Sample analysis will be conducted by ALS Environmental (ALS) in Jacksonville, FL under subcontract to EarthCon. ALS has been the laboratory subcontractor for prior sample analysis at this Site. The target analytical detection limits are listed on **Table 6**.

QA/QC

One field duplicate, one equipment blank, and one MS/MSD sample will be collected for each of the three sample media: surface water, sediment, and soil. The field duplicate samples will be submitted blind to the laboratory. The analytical results for the field samples and QA/QC samples will be validated by an EarthCon Sr. Chemist. The validation will include a review of sample preservation, holding times, duplicate precision, blank concentrations, and spike recoveries. The validation results, including the addition of sample codes to the analytical results will be summarized in a Data Validation Memo that will be included with the Report. Weather conditions/issues, and/or changes in site conditions, sample locations, or sampling methods will be noted in the field log book.

ECOLOGICAL RISK SCREENING

EPA has provided International Paper with a set of draft ecological screening values for comparison to the validated analytical results. These values for parameters selected for this event are listed in **Tables 1a, 1b and 1c** for surface water, **Tables 2a, 2b and 2c** for sediment and **Table 3** for soil.

REPORT

A written report of results will be provided to EPA. The report will include documentation of sampling data, analytical results, data validation, and ecological risk screening. In order to expedite EPA's review of the results, draft tables of the ecological risk screening results will be emailed to EPA prior to submittal of the full report.

SCHEDULE

It is proposed that EarthCon will mobilize to conduct the proposed sampling within one to two weeks of EPA acceptance of the Field Sampling Plan. The following expedited 9-week schedule is proposed listed in sequential weeks from Final Work Plan acceptance:

Preparation and Mobilization – 1 week
Sample collection - 1 week
Sample analysis – 3 weeks
Data validation – 1 week
Draft ecological risk screening results – 1 week
Draft Report submittal to IP - 1 week
Report submittal to EPA – 1 week

REFERENCES

2004. Corrective Measures Study Work Plan, International Paper Company, Treated Wood Products Plant, Wiggins, Mississippi, June 2004.

2005. Preliminary Corrective Measures Study Report, International Paper Company, Treated Wood Products Plant, Wiggins, Mississippi, October 2005.

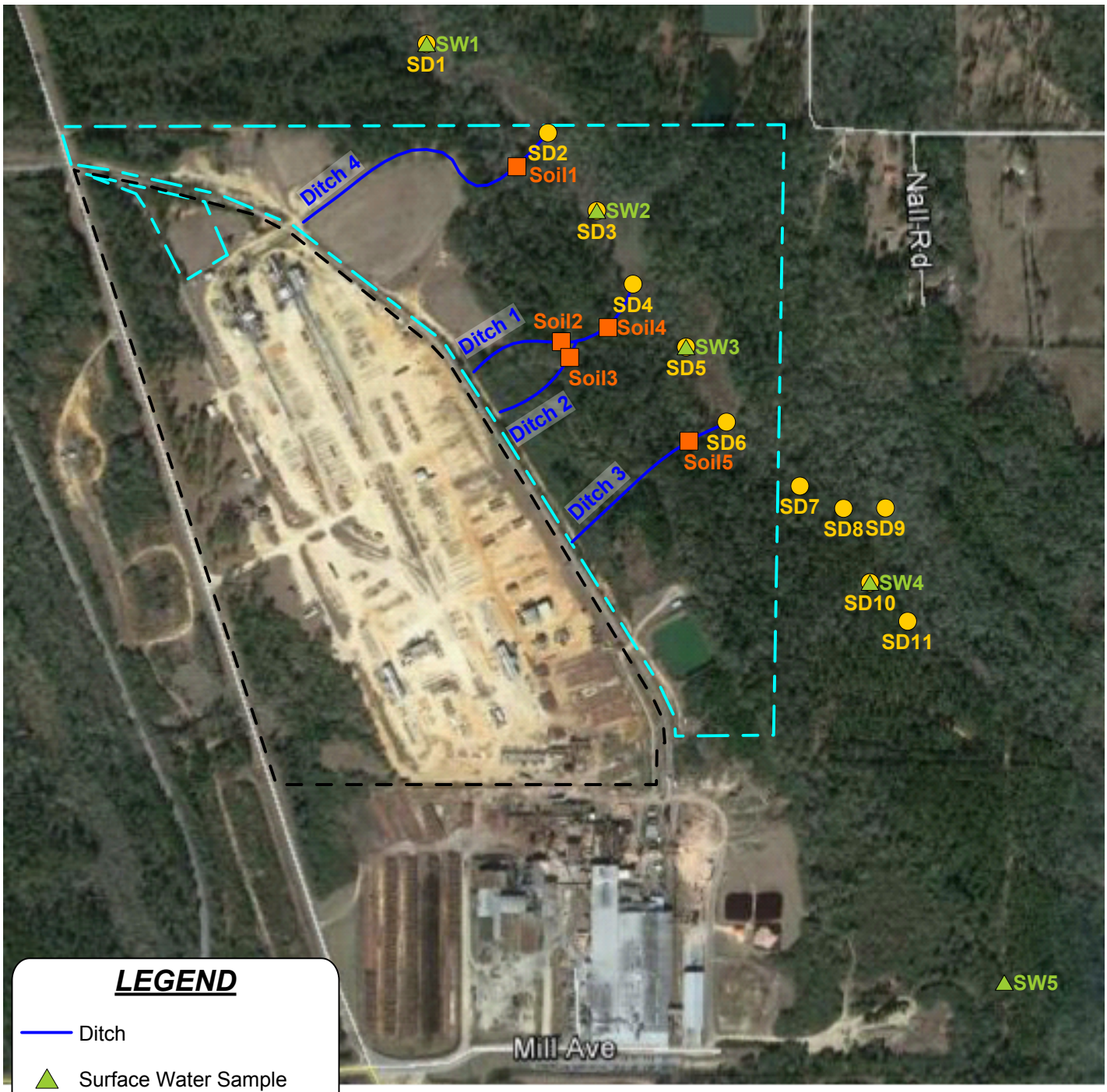
2008. Dioxin Soil Sampling Report, Former International Paper Treated Wood Products Facility, Wiggins, MS, December 23, 2008.

2012. Remaining Ecological Concerns Associated With the International Paper Treated Wood Products Facility Wiggins, Mississippi, TechLaw, September 6, 2012.

2014. Review of the Preliminary Corrective Measures Report for the International Paper Company Treated Wood Products Plant in Wiggins, Mississippi, United States Environmental Protection Agency, July 01, 2014.

ATTACHMENTS

Figure 1. Proposed 2015 Sampling Locations
Table 1a. Region 4 Surface Water Screening Values for Hazardous Waste Sites
Table 1b. Conversion Factors (CF) and Hardness-Dependent Equations
Table 1c. Example Freshwater Screening Values for Varying Degrees of Water Hardness
Table 2a Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites. Non-Narcotic Modes of Action
Table 2b. Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites. For Narcotic Mode of Action
Table 2c. Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites. (Organic Carbon Normalized)
Table 3. Region 4 Ecological Technical Advisory Group Sediment Soil Values for Hazardous Waste Sites.
Table 4. Sampling and Analysis Plan
Table 5. QA/QC Plan
Table 6. Sample Analytes
SOP 001 Sample Custody
SOP 002 Sample Packaging and Shipping
SOP 003 Field Documentation
SOP 004 Decontamination of Soil and Water Sampling Equipment
SOP 201 Soil Sample Collection
SOP 401 Surface Water Sampling
SOP 430 Sediment Sample Collection



LEGEND

- Ditch
- Surface Water Sample
- Sediment Sample
- Soil Sample
- International Paper Property Boundary
- Baldwin Pole Mississippi Property Boundary

Note:
Location of SD10 is approximate location of former SD-03
Location of SD9 is approximate location of former SD-04
Location of SD8 is approximate location of former SD-05

International Paper, Inc.-
Former Wood Treating Site
Wiggins, MS
1633 South 1st Street
Wiggins, MS

INTERNATIONAL PAPER

EARTHCON®

Proposed 2015 Sampling Locations

DESIGNED:	CHECKED:	DATE:	FIGURE NO.
DCW	DS	May 15, 2015	Figure 1
DRAWN: DCW	FILE NAME:	SCALE:	

Table 1a
Region 4 Surface Water Screening Values for Hazardous Waste Sites.

Chemical	CAS	Freshwater Screening Values (µg/L)			Saltwater Screening Values (µg/L)		
		Chronic	Acute	Source	Chronic	Acute	Source
Inorganic Compounds							
Metals							
Aluminum (pH 6.5 -9.0)	7429-90-5	87	750	a	1,900	3,288	c
Antimony	7440-36-0	190	900	b	30	180	c
Arsenic (unfiltered) ^	7440-38-2	150	340	a	36	69	a
Arsenic III (unfiltered) ^	22541-54-4	148	340	b	36	69	f
Barium	7440-39-3	220	2,000	b	-	-	-
Beryllium	7440-41-7	11	93	b	0.66	35	c
Boron	7440-42-8	7,200	34,000	b	1,000	-	NY
Cadmium (unfiltered) ^ *	7740-43-9	0.25	2	a	8.8	40	a
Calcium	7440-70-2	116,000	-	c	116,000	-	c
Chromium III (unfiltered) ^ *	16065-83-1	74	570	a	20	-	e
Chromium VI (unfiltered) ^	18540-29-9	11	16	a	50	1,100	a
Cobalt	7440-48-4	19	120	b	23	1,500	c
Copper (unfiltered) ^ *	7740-50-8	9	13	a	3.1	4.8	a
Iron	7439-89-6	1,000	300	a	300	-	?
Lead (unfiltered) ^ *	7439-92-1	2.5	65	a	8.1	210	a
Lithium	7439-93-2	440	910	b	14	260	c
Magnesium	7439-95-4	82,000	-	c	82,000	-	c
Manganese	7439-96-5	93	1,680	b	120	2,300	d, c
Mercury (unfiltered) ^ (aquatic)	7439-97-6	0.77	1.4	a	0.94	1.8	a
Mercury (wildlife based)	7439-97-6	0.0013	0.012	b, a	0.00053	0.025	a
Methylmercury (aquatic life)	22967-92-6	0.0028	0.099	c	0.0028	0.099	c
Molybdenum	7439-98-7	800	7,200	b	370	16,000	c
Nickel (unfiltered) ^ *	7440-02-0	52	470	a	8.2	74	a
Phosphorus (elemental)	7723-14-0	1,000	-	NJ	100	-	d
Potassium	7440-09-7	53,000	-	c	53,000	-	c
Selenium (unfiltered) ^ (aquatic)	7782-49-2	5	20	a	71	290	a
Silver (unfiltered) ^ *	7740-22-4	0.06	3.2	b	0.1	1.9	e, a
Sodium	7440-23-5	680,000	-	c	680,000	-	c
Strontium	7440-24-6	5,300	48,000	b	1,500	15,000	c
Thallium	7740-28-0	6	54	b	12	110	c
Tin	7440-31-5	180	1,600	b	73	2,700	c
Uranium	7440-61-1	2.6	46	c	2.6	46	c
Vanadium	7440-62-2	27	79	b	20	280	c
Zinc (unfiltered) ^ *	7740-66-6	120	120	a	81	90	a
Zirconium	7440-67-7	17	310	c	17	310	c
Other Inorganics							
Chloride	16887-00-6	230,000	860,000	a	-	-	-
Chlorine	7782-50-5	11	19	a	7.5	13	a
Cyanide (free)	57-12-5	5.2	22	a	1	1	a
Fluorides	16984-48-8	2,700	9,800	b	5,000	-	d
Hydrogen sulfide (S^{2-}, HS^-)	7783-06-4	2	3.2	a	2	-	a
Sulfite	14265-45-3	200	-	b	-	-	-

Table 1a
Region 4 Surface Water Screening Values for Hazardous Waste Sites.

Chemical	CAS	Freshwater Screening Values (µg/L)			Saltwater Screening Values (µg/L)		
		Chronic	Acute	Source	Chronic	Acute	Source
Volatile Organic Compounds (VOCs)							
Chlorinated alkanes							
1,1,1,2-Tetrachloroethane	630-20-6	85	770	b	10.8	-	d
1,1,2,2-Tetrachloroethane	79-34-5	200	910	b	610	2,100	c
1,1,1-Trichloroethane	71-55-6	76	690	b	11	200	c
1,1,2-Trichloroethane	79-00-5	730	3,200	b	1,200	5,200	c
1,1-Dichloroethane	75-34-3	410	3,700	b	47	830	c
1,2-Dichloroethane	107-06-2	2,000	8,200	b	910	8,800	c
1,2-Dichloropropane	78-87-5	520	3,300	b	-	3,400	g
Dichloromethane (Methylene chloride)	75-09-2	1,500	8,500	b	2,200	26,000	c
Trichloromethane (Chloroform)	67-66-3	140	1,300	b	28	490	c
Tetrachloromethane (Carbon tetrachloride)	56-23-5	77	690	b	9.8	180	c
Chlorinated alkenes							
1,1-Dichloroethene (1,1-Dichloroethylene)	75-35-4	130	1,200	b	25	450	c
1,2-Dichloroethene (1,2-Dichloroethylene)	540-59-0	970	8,800	b	590	1,100	c
1,2-cis-Dichloroethyene	156-59-2	620	5,500	b	--	--	--
1,2-trans-Dichloroethylene	156-60-5	558	10,046	b	--	--	--
1,3-Dichloropropene (cis and trans)	542-75-6	1.7	15	b	0.06	0.99	c
1,1,2,2-Tetrachloroethylene (PCE)	127-18-4	53	430	b	98	830	c
1,1,2-Trichloroethylene (TCE)	79-01-6	200	2,000	b	47	440	c
Chloroethene (Vinyl chloride)	75-01-4	930	8,400	b	-	-	-
Chlorobenzenes							
Chlorobenzene	108-90-7	25	220	b	64	1,100	c
1,2-Dichlorobenzene	95-50-1	23	130	b	14	260	c
1,3-Dichlorobenzene	541-73-1	22	79	b	71	630	c
1,4-Dichlorobenzene	106-46-7	9.4	57	b	15	180	c
1,2,3-Trichlorobenzene	87-61-6	5	390	NY, i	5	-	NY
1,2,4-Trichlorobenzene	120-82-1	130	420	b	110	700	c
1,3,5-Trichlorobenzene	108-70-3	5	390	NY, i	5	-	NY
Trichlorobenzene (mixed isomers)	12002-48-1	5	1,110	b, i	5	-	NY
Monoaromatic hydrocarbons							
1,2,4-Trimethylbenzene	95-63-6	15	140	b	-	-	-
1,3,5-Trimethylbenzene	108-67-8	26	230	b	-	-	-
Benzene	71-43-2	160	700	b	71.3	-	d
Cymene, p- (4-Isopropyltoluene)	99-87-6	16	150	b	-	-	-
Ethylbenzene	100-41-4	61	550	b	7.3	130	c
Isopropylbenzene (Cumene)	98-82-8	4.8	43	b	-	-	-
Styrene (vinyl benzene)	100-42-5	32	290	b	-	-	-
Toluene	108-88-3	62	560	b	9.8	120	c
Xylenes (total)	1330-20-7	27	240	b	13	230	c
Energetic VOAs							
Acetonitrile	75-05-8	12,000	100,000	b	-	-	-
Acrylonitrile	107-13-1	78	650	b	-	-	-
1,2-Diphenylhydrazine	122-66-7	1.1	9.6	b	-	-	-
Hydrazine	302-01-2	2	16	b	-	-	-

Table 1a
Region 4 Surface Water Screening Values for Hazardous Waste Sites.

Chemical	CAS	Freshwater Screening Values (µg/L)			Saltwater Screening Values (µg/L)		
		Chronic	Acute	Source	Chronic	Acute	Source
Ketones							
2-Butanone (methyl ethyl ketone)	78-93-3	22,000	200,000	b	14,000	240,000	c
2-Hexanone (methyl butyl ketone)	591-78-6	99	1,800	c	99	1,800	c
2-Octanone (methyl hexyl ketone)	111-13-7	8.3	150	c	8.3	150	c
4-Methyl-2-pentanone (MIBK)	108-10-1	170	2,200	c	170	2,200	c
Acetone	67-64-1	1,700	15,000	b	1,500	28,000	c
Other VOCs							
1-Pentanol	71-41-0	110	2,000	c	110	2,000	c
2-Propanol	67-63-0	7.5	130	c	7.5	130	c
Acetaldehyde	75-07-0	130	1,200	b	1.4	-	e
Acrolein	107-02-8	3	3	a	-	-	-
Bromoform (tribromomethane)	75-25-2	230	1,100	b	320	2,300	c
Bromomethane (methyl bromide)	74-83-9	16	38	b	-	-	-
Carbon disulfide	75-15-0	15	130	b	0.92	17	c
Cyclohexane	110-82-7	230	-	e	120	-	e
Dibromochloromethane	124-48-1	320	2,900	b	34	-	d
Dichlorobromomethane	75-27-4	340	3,100	b	-	-	-
Ethylene glycol	107-21-1	140,000	1,300,000	b	-	-	-
Hexane	110-54-3	0.58	10	c	0.58	10	c
Hexachloroethane	67-72-1	12	210	c	12	210	c
Methanol	67-56-1	330	3,000	b	-	-	-
Methylamine	74-89-5	860	7,700	b	-	-	-
Methyl tert-butyl ether (MTBE)	1634-04-4	730	6,500	b	18,000	53,000	NJ
Propylene glycol	57-55-6	71	640	b	-	-	-
Tetrahydrofuran	109-99-9	11,000	74,000	b	-	-	-
Vinyl acetate	108-05-4	16	280	c	16	280	c
Semivolatile Organic Compounds							
Chloroanilines							
4-Chloroaniline	106-47-8	19	460	j	-	-	-
2,4-Dichloroaniline	554-00-7	15	575	j	-	-	-
Pentachloroaniline	527-20-8	5	415	j	-	-	-
Chlorobenzenes							
1,2,3,4-Tetrachlorobenzene	634-66-2	3.4	18	MI	-	-	-
1,2,4,5-Tetrachlorobenzene	95-94-3	8.3	75	b	-	-	-
Chlorobenzene	108-90-7	25	220	b	64	1,100	c
Hexachlorobenzene (wildlife based)	118-74-1	0.0003	-	MI	-	-	-
Pentachlorobenzene (aquatic only)	608-93-5	3.1	16	b	0.47	8.4	c
Pentachlorobenzene (wildlife based)	608-93-5	0.019	-	MI	-	-	-
Chlorophenols							
2-Chlorophenol	95-57-8	32	290	b	400	-	d
2,4-Dichlorophenol	120-83-2	11	110	b	790	-	d
2,4,5-Trichlorophenol	95-95-4	1.9	17	b	12	259	TX
2,4,6-Trichlorophenol	88-06-2	4.9	39	b	6.5	-	d
2,3,4,6-Tetrachlorophenol	58-90-2	1.2	11	MI	-	-	-
3-Methyl-4-Chlorophenol	59-50-7	7.4	67	MI	-	-	-

Table 1a
Region 4 Surface Water Screening Values for Hazardous Waste Sites.

Chemical	CAS	Freshwater Screening Values (µg/L)			Saltwater Screening Values (µg/L)		
		Chronic	Acute	Source	Chronic	Acute	Source
Other Phenols							
2-Methylphenol (Cresol, o-)	95-48-7	67	600	b	13	230	c
3-Methylphenol (Cresol, m-)	108-39-4	62	560	b	-	-	-
4-Methylphenol (Cresol, p-)	106-44-5	53	480	b	-	-	-
2,3-Dimethylphenol	526-75-0	120	1,100	MI	-	-	-
2,4-Dimethylphenol	105-67-9	15	140	b	-	-	-
2-Nitrophenol	88-75-5	73	650	b	-	-	-
4-Nitrophenol	100-02-7	58	530	b	300	1,200	c
2,4-Dinitrophenol	51-28-5	71	379	b	14.3	--	d
2,4,6-Tribromophenol	118-79-6	5.6	50	b	-	-	-
Nonylphenol	84852-15-3	6.6	28	TX	1.7	7	TX
Pentachlorophenol # (aquatic)	87-86-5	15	19	a	7.9	13	a
Phenol	108-95-2	160	4,700	b	58	300	MS
Energetic SVOAs							
2-Amino-4,6-dinitrotoluene	35572-78-2	18	160	b	20	180	k
4-Amino-2,6-dinitrotoluene	19406-51-0	11	98	b	-	-	-
1,3-Dinitrobenzene (DNB)	99-65-0	22	100	b	20	110	k
2,3-Dinitrotoluene	602-01-7	2.3	21	b	-	-	-
2,4-Dinitrotoluene	121-14-2	44	390	b	9.1	200	d, g
2,5-Dinitrotoluene	619-15-8	5.6	50	b	-	-	-
2,6-Dinitrotoluene	606-20-2	81	730	b	-	200	g
3,5-Dinitrotoluene	618-85-9	95	860	b	-	-	-
3,5-Dinitroanaline (DNA)	618-87-1	60	230	k	60	230	k
HMX (Octahydro-tetranitro-1,3,5,7-	2691-41-0	220	1,200	b	330	1,880	k
Nitroglycerine	55-63-0	18	160	b	-	-	-
2-Nitrotoluene	88-72-2	71	640	b	-	-	-
3-Nitrotoluene	99-08-1	42	380	b	-	-	-
4-Nitrotoluene	99-99-0	46	410	b	-	-	-
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	121-82-4	79	520	b	190	700	k
1,3,5-Trinitrobenzene (TNB)	99-35-4	11	27	b	10	30	k
2,4,6-Trinitrotoluene (TNT)	118-96-7	13	120	b	90	570	k
Phthalates							
bis(2-Ethylhexyl) Phthalate	117-81-7	3	27	c	3	27	c
Butylbenzyl Phthalate	85-68-7	23	130	b	19	--	c
Diethyl Phthalate	84-66-2	220	980	b	210	1,800	c
Dimethyl Phthalate	131-11-3	1,100	3,200	b	2,900	-	e
Di-n-Butyl Phthalate	84-74-2	19	34	b	35	190	c

Table 1a
Region 4 Surface Water Screening Values for Hazardous Waste Sites.

Chemical	CAS	Freshwater Screening Values (µg/L)			Saltwater Screening Values (µg/L)		
		Chronic	Acute	Source	Chronic	Acute	Source
Polycyclic Aromatic Hydrocarbons (PAHs)							
1-Methylnaphthalene	90-12-0	2.1	37	c	2.1	37	c
2-Methylnaphthalene	91-57-6	4.7	42	b	72	86, i	EPA 2003
Acenaphthene	83-32-9	15	19	b	20	86, i	NY
Acenaphthylene	208-96-8	13	120	b	307	582, i	EPA 2003
Anthracene	120-12-7	0.02	0.18	b	0.73	13	c
Benz(a)anthracene	56-55-3	4.7	42	b	0.027	0.49	c
Benzo(a)pyrene	50-32-8	0.060	0.54	b	0.3	2, i	c
Benzo(b)fluoranthene	205-99-2	2.6	23	b	0.68	2, i	EPA 2003
Benzo(g,h,i)perylene	191-24-2	0.44	6, j	EPA 2003	0.44	0.5, i	EPA 2003
Benzo(k)fluoranthene	207-08-9	0.64	4, i	EPA 2003	0.64	2, i	EPA 2003
Chrysene	218-01-9	4.7	42	b	2	6.5, i	EPA 2003
Dibenz(a,h)anthracene	53-70-3	0.28	6, j	EPA 2003	0.28	1.2 i	EPA 2003
Fluoranthene	206-44-0	0.8	3.7	b	7.1	21, i	EPA 2003
Fluorene	86-73-7	19	110	b	3.9	70	c
Indeno(1,2,3-cd)pyrene	193-39-5	0.28	6, j	EPA 2003	0.28	0.5, i	EPA 2003
Naphthalene	91-20-3	21	170	b	12	190	c
Phenanthrene	85-01-8	2.3	31	b	4.6	7.7	TX
Pyrene	129-00-0	4.6	42	b	10	21, i	EPA 2003
Other SVOCs							
1,1-Biphenyl	92-52-4	6.5	26	b	14	-	c
2,2-Dibromo-3-nitrilopropionamide	10222-01-2	20	50	b	-	-	-
3,3'-Dichlorobenzidine	91-94-1	4.5	41	MI	-	-	-
4-Bromophenyl Phenyl Ether	101-55-3	1.5	0	c	1.5	-	c
Aniline	62-53-3	4.1	30	b	-	-	-
Benzaldehyde	100-52-7	57	547	j	-	-	-
Benzidine	92-87-5	1.5	14	b	3.9	70	c
Benzoic Acid	65-85-0	42	740	c	42	740	c
Benzyl alcohol	100-51-6	8.6	150	c	8.6	150	c
Decane	124-18-5	49	880	c	49	880	c
Dibenzofuran	132-64-9	4	36	b	3.7	66	c
Hexachlorobutadiene (Aquatic Life)	87-68-3	1	10	b	0.3	3	NY
Hexachlorobutadiene (Wildlife Based)	87-68-3	0.053	-	MI	-	-	-
Hexachlorocyclopentadiene	77-47-4	0.45	4.5	b	0.07	0.7	NY
Hydroquinone	123-31-9	2.2	4.4	b	-	-	-
Isodecyl diphenyl phosphate	29761-21-5	1.73	22	b	-	-	-
Isophorone	78-59-1	920	7,500	b	-	4,300	g
N-Nitrosodiphenylamine	86-30-6	25	220	b	210	3,800	c
Nitrobenzene	98-95-3	380	2,000	b	-	2,000	g
Propylene glycol	57-55-6	71	640	b	-	-	-
Quinoline	91-22-5	3.4	-	h	-	-	-
Triphenyl phosphate	115-86-6	4	40	b	-	-	-

Table 1a
Region 4 Surface Water Screening Values for Hazardous Waste Sites.

Chemical	CAS	Freshwater Screening Values (µg/L)			Saltwater Screening Values (µg/L)		
		Chronic	Acute	Source	Chronic	Acute	Source
Pesticides, Herbicides, Fungicides							
2,4-D	94-75-7	79.2	130	OPP	70	-	d
4,4'-DDT (Aquatic Life Only)	50-29-3	0.0032	1.1	a	0.001	0.13	a
4,4'-DDE	72-55-9	0.41	14	j	-	-	-
4,4'-DDD	72-54-8	0.011	0.19	c	0.011	0.19	c
Acephate	30560-19-1	150	550	OPP	-	-	-
Aldrin	309-00-2	0.035	3.0	b	0.00014	1.3	d
Atrazine	1912-24-9	12	330	b	-	-	-
Azinphos-methyl (Guthion)	86-50-0	0.01	0.08	a, OPP	0.01	-	a
BHC (beta)	319-84-6	0.046	-	d	0.046	-	d
BHC-gamma (Lindane) (Aquatic Life)	58-89-9	0.11	0.95	b, a	0.063	0.16	d, a
BHC-gamma (Lindane) (Wildlife Based)	58-89-9	0.026	-	MI	-	-	-
Carbaryl	63-25-2	0.5	0.85	OPP	-	1.6	a
Carbofuran	1563-66-2	0.75	1.12	OPP	-	-	-
Captan	133-06-2	-	13.1	OPP	-	-	-
Chlordane	57-74-9	0.0043	2.4	a	0.00059	0.004	d
Chlorothalonil	1897-45-6	0.6	1.8	OPP	-	-	-
Chloropyrifos	2921-88-2	0.041	0.05	a, OPP	0.0056	0.011	a
Cyanazine	21725-46-2	270	2420	b	--	--	--
Demeton	8065-48-3	0.1	-	b, a	0.1	-	a
Diazinon	333-41-5	0.17	0.17	a	0.82	0.82	a
Dicamba	1918-00-9	3898	216	b	-	-	-
Dieldrin	60-57-1	0.056	0.24	a	0.0019	0.71	a
Dimethoate	60-51-5	0.5	21.5	OPP	-	-	-
Dinoseb	88-85-7	0.48	9.5	MI	-	-	-
Diquat	2764-72-9	6	54	b	-	-	-
Endosulfan-alpha	959-98-8	0.01	0.11	OPP	0.0087	0.034	a
Endosulfan-beta	33213-65-9	0.01	0.11	OPP	0.0087	0.034	a
Endosulfan Sulfate	1031-07-8	0.056	0.22	MS	0.0087	0.034	MS
Endrin	72-20-8	0.036	0.086	a	0.0023	0.037	a
Heptachlor	76-44-8	0.0038	0.52	a	0.0036	0.053	a
Heptachlor Epoxide	1024-57-3	0.0038	0.52	a	0.0036	0.053	a
Malathion	121-75-5	0.035	0.295	OPP	0.1	-	a
MCPA (2-methyl-4-chlorophenoxyacetic acid)	94-74-6	2.6	-	h	4.2	-	h
Methoxychlor	72-43-5	0.03	0.7	a	0.019	-	c
Metolachlor	51218-45-2	15	110	MI	-	-	-
Mirex (Aquatic Life)	2385-85-5	0.001	0.001	a	0.001	0.001	a
Mirex (Wildlife Based)	2385-85-5	0.000016	-	MI	-	-	-
Parathion	56-38-2	0.013	0.065	a	0.04	-	d
Silvex (2,4,5-TP)	93-72-1	30	270	MI	50	-	f
Simazine	122-34-9	9	80	b	-	-	-
Toxaphene	8001-35-2	0.0002	0.73	a	0.0002	0.21	a
Trifluralin	1582-09-8	1.14	20.5	OPP	-	-	-
Polychlorinated Biphenyls (PCBs) and Dioxin/Furans							
2,3,7,8-TCDD (Dioxin)	1746-01-6	3.10E-09	-	b	-	-	-
Dioxins (TEQ)		-	0.003	g	-	-	-
Total PCBs (Wildlife Based)	1336-36-3	0.000074	0.014	b	0.000072	0.03	NJ

Table 1a
Region 4 Surface Water Screening Values for Hazardous Waste Sites.

Chemical	CAS	Freshwater Screening Values (µg/L)			Saltwater Screening Values (µg/L)		
		Chronic	Acute	Source	Chronic	Acute	Source
Other							
Alkalinity	-	20,000	-	a	-	-	-
Ammonia ^^	7664-41-7	Varies	Varies	a	0.024	0.094	NJ
Formaldehyde	50-00-0	74	660	b	-	-	-
Nitrite (warm water)	14797-65-0	20	100	b	-	-	-
pH	-	6.5 - 9.0	-	a	6.5 - 8.5	-	a
Selenate	14124-68-6	9.5	12.5	b	-	-	-
Selenite	14124-67-5	27.6	186	b	-	-	-
Tributyltin	688-73-3	0.072	0.46	a	0.0074	0.42	a
Urea	57-13-6	17,000	150,000	b	-	-	-

Table 1a Notes:

Red font indicates a bioaccumulative chemical.

- Chemical that should be evaluated with the SUM Toxic Unit Approach as discussed in Text Section 3.1.5.

^ - Screening value is for total metals. A conversion factor (CF) was used to convert the screening value for total metals in surface water to a screening value for dissolved metals in surface water. CMC (dissolved) = CMC (total) × CF. See table 1a for screening values for dissolved metals.

* - The freshwater screening value is hardness dependent. The screening value shown in Table 1a is for total metals assuming a hardness of 50 mg/L as $CaCO_3$. A correction for site-specific hardness was based on equations in reference [1] where *H* is $CaCO_3$ hardness in mg/L. Equations are in the form $CMC\ (dissolved) = exp\{m_A\ [ln(H)]+ b_A\}\ [CF]$. The conversion factor (CF) is omitted when calculating the *CMC* or *CCC* for unfiltered samples. See Table 1b for hardness-specific conversion factors. See Table 1c for freshwater screening values for varying degrees of hardness. If hardness data are unavailable hardness may be estimated as: H = 2.497 × Ca (mg/L) + 4.118 × Mg (mg/L).

- Freshwater criteria for pentachlorophenol are pH Dependent. Values displayed are for a pH of 7.8.

^^ - Criteria for ammonia are pH, temperature, and lifestage dependent.

Table 1a Sources:

a - National Recommended Water Quality Criteria http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

b - Great Lakes Initiative (GLI) Clearinghouse resources Tier II criteria revised 2013 http://www.epa.gov/gliclearinghouse/

c - Suter, G.W. II, and Tsao, C.L. 1996. Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1996 Revision. ES/ER/TM-96/R2. http://www.esd.ornl.gov/programs/ecorisk/documents/tm96r2.pdf

d - Florida (add citation)

e - North Carolina (add citation)

f - Georgia (add citation)

g - Hawaii Department of Health (HDOH) Environmental Action Levels, Chronic and Acute Surface Water (Aquatic Habitat) Standards http://eha-web.doh.hawaii.gov/eha-cma/Leaders/HEER/environmental-hazard-evaluation-and-environmental-action-levels

h - CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Environmental Quality Guidelines: Summary Table December 2003. Canadian Council of Ministers of the Environment, Winnipeg, Manitoba. Available at: http://www.ccme.ca/publications/ceqg_rcqe.html .

i - Region 4 Surface Water Model - See text Section 6.1.2 Equation 1.

j - ECOSAR program predicted lowest chronic value. Lowest acute value was divided by 2.

k - Talmadge et al. (1999)

Table 1b
Conversion Factors (CF) and Hardness-Dependent Equations

Chemical	Freshwater						Saltwater	
	Chronic Values			Acute values			Conversion Factors	
	m_A	b_A	*CF*	m_A	b_A	*CF*	*CF - Chronic*	*CF - Acute*
Beryllium *	1.609	-5.017		1.609	-2.874			
Cadmium	0.7409	-4.719	1.101672-0.041838(lnH)	1.0166	-3.924	1.136672-0.041838 (lnH)	0.994	0.994
Chromium III	0.819	0.6848	0.86	0.819	3.7256	0.316	NA	NA
Chromium VI			0.962			0.982	0.993	0.993
Copper	0.8545	-1.702	0.96	0.9422	-1.7	0.96	0.83	0.83
Lead	1.273	-4.705	1.46203-0.145712(lnH)	1.273	-1.46	1.46203-0.145712 (lnH)	0.951	0.951
Mercury			0.85			0.85	0.85	0.85
Nickel	0.846	0.0584	0.997	0.846	2.255	0.998	0.99	0.99
Selenium							0.998	0.998
Silver				1.72	-6.59	0.85	NA	0.85
Zinc	0.8473	0.884	0.986	0.8473	0.884	0.978	0.986	0.978

Notes:

* - beryllium hardness-based Great Lakes Tier 2 equation

m_A -

b_A -

CF - Conversion Factor

InH - natural log of Hardness

Filtered Chronic Screening Value = $\exp\{m_A[\ln(H)]+b_A\}$ [CF]

Table 1c
Example Freshwater Screening Values for Varying Degrees of Water Hardness

CHEMICAL	Unfiltered Samples							
	Chronic Values (µg/L)				Acute Values (µg/L)			
	Hardness (mg/kg $CaCO_3$)				Hardness (mg/kg $CaCO_3$)			
	25	50	100	200	25	50	100	200
Beryllium	1.2	3.5	11	33	10	30	93	285
Cadmium	0.10	0.16	0.27	0.45	0.52	1.1	2.1	4.3
Chromium III	23.8	39	86	152	183	1,000	1,800	3,200
Copper	2.74	4.9	8.9	16	3.6	7.3	14	27
Lead	0.54	1.3	3.2	7.69	13.9	34	82	197
Nickel	16.1	29	52	94	145	261	469	843
Silver	-	-	-	-	0.30	1.1	3.8	12
Zinc	36	67	120	216	36	67	120	216

Notes:
µg/L - micrograms per liter
mg/L - milligrams per liter

Table 2a
Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites.
Non-Narcotic Modes of Action

Chemical		CAS	Freshwater Sediment Screening Value (mg/kg)		Source	Marine/Estuarine Sediment Screening Value (mg/kg)		Source
			Chronic	Acute		Chronic	Acute	
Inorganic Compounds (dry weight)								
Metals (mg/kg dw)								
Aluminum		7429-90-5	25,000	58,000	h	-	-	-
Antimony		7440-36-0	2	25	a	2	25	a
Arsenic		7440-38-2	9.8	33	b	7.24	41.6	c
Barium		7440-39-3	20	60	b	-	-	-
Boron		7440-42-8	-	-	-	-	-	-
Cadmium		7440-43-9	1	5	b	0.68	4.21	c
Chromium (Total)		7440-47-3	43.4	111	b	52.3	160	c
Cobalt		7440-48-4	50	-	f	-	-	-
Copper		7440-50-8	31.6	149	b	18.7	108	c
Iron		7439-89-6	20,000	40,000	-	-	-	-
Lead		7439-92-1	35.8	128	b	30.2	112	c
Manganese		7439-96-5	460	1,100	f	-	-	-
Mercury		7439-97-6	0.18	1.1	b	0.13	0.7	c
Nickel		7440-02-0	22.7	48.6	b	15.9	42.8	c
Selenium		7782-49-2	11	20	g	-	-	-
Silver		7440-22-4	1	2.2	b	0.73	1.77	c
Thallium		7440-28-0	-	-	-	-	-	-
Uranium		7440-61-1	100	1,000	h	-	-	-
Zinc		7440-66-6	121	459	b	124	271	c
Other Inorganics (mg/kg)								
Ammonia		7664-41-7	230	300	g	-	-	-
Sulfides (Total)		18946-25-8	39	61	g	-	-	-
Volatile Organic Compounds (VOCs) - µg/kg								
Acetaldehyde	R	75-07-0	1.3		d	342		e
Acrylonitrile	R	107-13-1	6.6		d	-	-	-
1,2-Diphenylhydrazine	R	122-66-7	3.5		d	-	-	-
Methylamine	R	74-89-5	33		d	-	-	-
Vinyl acetate	N3	108-05-4	0.9		d	0.9		d
Semivolatile Organic Compounds (SVOCs) - µg/kg								
Phenols								
2-Chlorophenol	N2	95-57-8	61		d	764		e
2-Methylphenol (o-cresol)	N2	95-48-7	99		d	19	63	d, g
2,3-Dimethylphenol	N2	526-75-0	349		d	-	-	-
2,4-Dimethylphenol	N2	105-67-9	35		c	29	29	g
3-Methylphenol (Cresol, m-)	N2	108-39-4	93		d	-	-	-
4-Methylphenol (p-Cresol)	N2	106-44-5	77	2,000	d, g	670	670	g
2-Nitrophenol	N2	88-75-5	146		d	-	-	-
4-Nitrophenol	N2	100-02-7	135		d	699		e
2,4-Dinitrophenol	U	51-28-5	202		d	40.5		d
2-Methyl-4,6-Dinitrophenol	U	534-52-1	2,477		e	-	-	-
2,4,5-Trichlorophenol	N2	95-95-4	34		d	213		e
2,4,6-Trichlorophenol	N2	88-06-2	87		d	115		e
3-Methyl-4-Chlorophenol	N2	59-50-7	36		d	-	-	-
Pentachlorophenol	U	87-86-5	744	1,200	d, g	360	690	g
Phenol	N2	108-95-2	120	210	g	420	1,200	g
Energetic SVOAs								
2-Amino-4,6-dinitrotoluene	U	35572-78-2	41		d	-	-	-
4-Amino-2,6-dinitrotoluene	U	19406-51-0	25		d	-	-	-
1,3-Dinitrobenzene	U	99-65-0	34		d	795		e
2,3-Dinitrotoluene	R	602-01-7	8.5		d	1,168		e
2,4-Dinitrotoluene	R	121-14-2	126		d	26		d
2,5-Dinitrotoluene	R	619-15-8	21		d	1,168		e
2,6-Dinitrotoluene	R	606-20-2	271		d	1,084		e
3,5-Dinitrotoluene	R	618-85-9	352		d	1,168		e
HMX (Octahydro-tetranitro-1,3,5...)	C	2691-41-0	42		d	-	-	-
Nitroglycerine	R	55-63-0	4.6		d	-	-	-
RDX (Hexahydro-1,3,5-trinitro-1,3,5...)	R	121-82-4	41		d	-	-	-
1,3,5-Trinitrobenzene	R	99-35-4	11		d	782		e
2,4,6-Trinitrotoluene (TNT)	R	118-96-7	23		d	888		e
Other SVOCs								
4-Chloroaniline	N2	106-47-8	316		e	-	-	-
2,4-Dichloroaniline	N2	554-00-7	328		e	-	-	-
Pentachloroaniline	U	527-20-8	920		e	-	-	-
2,2-Dibromo-3-nitrilopropionamide	R	10222-01-2	1.1		d	1.1		e

Table 2a
Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites.
Non-Narcotic Modes of Action

Chemical		CAS	Freshwater Sediment Screening Value (mg/kg)		Source	Marine/Estuarine Sediment Screening Value (mg/kg)		Source
			Chronic	Acute		Chronic	Acute	
3,3'-Dichlorobenzidine	N2	91-94-1	30		d	30		e
Aniline	N2	62-53-3	1.0		d	1.0		e
Benzaldehyde	R	100-52-7	462		e	-	-	-
Benzidine	N2	92-87-5	0.6		d	1.6		d
bis(2-Chloroethyl) Ether	R	111-44-4	4,761		e	-	-	-
Decane	N2	124-18-5	491		e	308		e
Hexachlorobutadiene	R	87-68-3	11	120	f	-	-	-
Hexachlorobutadiene (Aquatic Toxicity)	R	87-68-3	8.5		d	2.5		d
Hexachlorobutadiene (Wildlife based)	R	87-68-3	0.4		d	-	-	-
Hexachlorocyclopentadiene	R	77-47-4	6.3		d	1.0		d
Hydroquinone	R	123-31-9	0.8		d	301		e
Pesticides - µg/kg								
2,4-D	H	94-75-7	23		d	21		d
4,4'-DDD	C	72-54-8	1.22	7.81	c	1.22	7.81	c
Total DDD	C	-	4.88	28	b	2	20	a
4,4'-DDE	C	72-55-9	2.07	3.74	c	2.07	3.74	c
Total DDE	C	-	3.16	31.3	b	2	15	a
4,4'-DDT (Aquatic Life)	C	50-29-3	5.4		d	1.7		d
4,4'-DDT (Wildlife Based)	C	50-29-3	0.02		d	0.01		d
4,4'-DDT	C	50-29-3	1.19	4.77	c	1.19	4.77	c
Total DDT	C	-	4.16	62.9	b	3.89	51.7	c
DDT/DDE/DDD (total)	C	-	5.28	572	b	-	-	-
Acephate	A	30560-19-1	5.4		d	1,289		e
Acrolein	R	107-02-8	0.03		d	-	-	-
Aldrin	C	309-00-2	29		d	0.11		d
Atrazine	H	1912-24-9	0.3	-	b	0.3		b
Atrazine	H	1912-24-9	17.3		d	862		e
BHC (alpha)	C	319-84-6	1.3		d	1.3		d
BHC (beta)	C	319-85-7	303		e	-	-	-
BHC (delta)	C	319-86-8	473		e	-	-	-
BHC-gamma (Lindane)	C	58-89-9	2.37	4.99	b	0.32	0.99	c
BHC-gamma (Lindane) (Aquatic Life)	C	58-89-9	3.1		d	-	-	-
BHC-gamma (Lindane) (Wildlife Based)	C	58-89-9	0.7		d	-	-	-
Carbaryl	A	63-25-2	0.7		d	-	-	-
Carbofuran	A	1563-66-2	0.7		d	-	-	-
Captan	F	133-06-2	396		e	-	-	-
Chlordane	C	57-74-9	3.24	17.6	b	2.26	4.79	c
Chlordane	C	57-74-9	2.9		d	0.4		d
Chlorothalonil	R	1897-45-6	6.2		d	304		e
Chloropyrifos	A	2921-88-2	3		d	0.41		d
Cyanazine	H	21725-46-2	362		d	-	-	-
Demeton	A	126-75-0	0.13		d	-	-	-
Diazinon	A	333-41-5	0.38	-	b	-	-	-
Diazinon	A	333-41-5	3.7		d	18		d
Dicamba	H	1918-00-9	1,059		d	-	-	-
Dieldrin	C	60-57-1	1.9	9.3	b, g	0.715	4.3	c
Dieldrin (Aquatic Life)	C	60-57-1	2.9		d	0.1		d
Dieldrin (Wildlife Based)	C	60-57-1	0.004		d	-	-	-
Dimethoate	A	60-51-5	0.06		d	21,700		e
Dinoseb	H	88-85-7	15		d	-	-	-
Diquat	H	2764-72-9	23		d	-	-	-
Endosulfan-alpha	C	959-98-8	0.16		d	0.14		d
Endosulfan-beta	C	33213-65-9	0.16		d	0.14		d
Endosulfan Sulfate	C	1031-07-8	0.72		d	0.11		d
Endrin	C	72-20-8	2.22	207	b	2.67	62	i
Endrin	C	72-20-8	1.8		d	0.12		d
Endrin ketone	C	53494-70-5	8.5	-	g	-	-	-
Heptachlor	C	76-44-8	1.6		d	1.5		d
Heptachlor epoxide	C	1024-57-3	2.47	16	b	0.6	2.7	i
Heptachlor epoxide	C	1024-57-3	0.15		d	0.14		d
Malathion	A	121-75-5	0.67	-	b	-	-	-
Malathion	A	121-75-5	0.011		d	0.03		d
MCPA (2-methyl-4-chlorophenoxyacetic acid)	H	94-74-6	12,291		e	2,218	-	e
Methoxychlor	C	72-43-5	2.1		d	1.34		d
Metolachlor	H	51218-45-2	37		d	311		e
Mirex (Aquatic Life)	C	2385-85-5	3.6		d	3.6		d
Mirex (Wildlife Based)	C	2385-85-5	0.06		d	-	-	-

Table 2a
Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites.
Non-Narcotic Modes of Action

Chemical		CAS	Freshwater Sediment Screening Value (mg/kg)		Source	Marine/Estuarine Sediment Screening Value (mg/kg)		Source
			Chronic	Acute		Chronic	Acute	
Parathion	A	56-38-2	0.2		d	0.6		d
Silvex (2,4,5-TP)	H	93-72-1	53		d	88		d
Simazine	H	122-34-9	0.34	-	b	-	-	-
Simazine	H	122-34-9	7.5		d	-	-	-
Toxaphene	C	8001-35-2	0.15		d	0.15		d
Trifluralin	H	1582-09-8	187		d	-	-	-
Polychlorinated Biphenyls (PCBs) and Dioxins/Furans - µg/kg								
Total PCBs	E	1336-36-3	59.8	676	b	21.6	130	c, g
Total PCBs (Wildlife Based)	E	1336-36-3	0.026		d	0.025		d
Dioxins/Furans	E	1746-01-6	0.0025	0.025	j	0.0025	0.025	j
2,3,7,8-TCDD (Dioxin) (Wildlife Based)	E	1746-01-6	0.0000021		d	-	-	-
Other - µg/kg								
Butyl tins								
Monobutyltin		78763-54 -9	540	4,800	g	-	-	-
Dibutyltin		818-08-6	910	130,000	g	-	-	-
Tributyltin		688-73-3	47	320	g	-	-	-
Tetrabutyltin		1461-25-2	97	97	g	-	-	-
Bulk Petroleum Hydrocarbons - mg/kg								
Total Petroleum Hydrocarbons - Diesel		68334-30-5	340	510	g	-	-	-
Total Petroleum Hydrocarbons - Residual		68476-53-9	3,600	4,400	g	-	-	-

Table 2 Notes:
- No data available
CAS = chemical abstract service registry number
R - Reactive electrophiles/proelectrophiles
N2 - Polar Narcosis
N3 - Diesters
U - Oxidative phosphorylation uncouplers
H - Herbicides
C - Central nervous system seizure agents
A - Acetylcholinesterase inhibitors
F - Fungacide
E - Endocrine disrupters or reproductive and developmental toxicants

Table 2a Sources:
Red font indicates a bioaccumulative chemical.

a - Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. Used effects range low (ER-L) for chronic and effects range medium (ER-M) for acute.

b - MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Used threshold effect concentration (TEC) for chronic and probable effect concentration (PEC) for acute.

c - MacDonald, D.D. 1994. Approach to the Assessment of Sediment Quality in Florida Coastal Waters. Florida Department of Environmental Protection. 1994 Florida Sediment Quality Assessment Guidelines for Florida Coastal Waters.

d - Region 4 Sediment Model based on highest ranked surface water quality ESV from Table 1a (chronic water quality ESV * Koc) at 1% organic carbon.

e - Region 4 Sediment Model based on lowest predicted surface water value from 3 different models (predicted chronic water quality benchmark * Koc) at 1% OC. See text.

f - Persaud, D., R. Jaagumagi and A. Hayton. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Ontario Ministry of the Environment. Queen's Printer of Ontario.

g - Washington State Sediment Management Standards, Cleanup Objectives. http://www.ecy.wa.gov/programs/tcp/smu/sed_standards.htm

h - Los Alamos National Laboratory ECORISK Database. http://www.lanl.gov/community-environment/environmental-stewardship/protection/eco-risk-assessment.php

i - CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Environmental Quality Guidelines: Summary Table December 2003. Canadian Council of Ministers of the Environment, Winnipeg, Manitoba. Available at http://www.ccme.ca/publications/ceqg_rcqe.html

j - USEPA. 1993. Interim Report on Data and Methods for Assessment of 2,3,7,8 - Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife. EPA/600/R-93/055. Available from the National Service Center for Environmental Publications (NSCEP) Document Number 600R93055. http://www.epa.gov/nscep/

Table 2b

Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites.

for Narcotic Mode of Action

Chemical	*CAS*	*Freshwater Sediment Screening Value (µg/kg 1% OC)*		*Source*	*Marine/Estuarine Sediment Screening Value (µg/kg 1% OC)*		*Source*
		Narcosis	*Acute*		*Narcosis*	*Acute*	
Volatile Organic Compounds (VOCs) - µg/kg							
Chlorinated alkanes							
1,1,1,2-Tetrachloroethane	630-20-6	73		a	9.3		a
1,1,2,2-Tetrachloroethane	79-34-5	190		a	579		b
1,1,1-Trichloroethane	71-55-6	33		a	4.8		a
1,1,2-Trichloroethane	79-00-5	319		a	524		b
1,1-Dichloroethane	75-34-3	130		a	15		a
1,2-Dichloroethane	107-06-2	188		a	175		a
1,2-Dichloropropane	78-87-5	272		a	1,901		b
Dichloromethane (methylene chloride)	75-09-2	182		a	267		b
Trichloromethane (Chloroform)	67-66-3	45		a	8.9		a
Tetrachloromethane (Carbon tetrachloride)	56-23-5	34		a	4.3		a
Chlorinated alkenes							
1,1-Dichloroethene (1,1-Dichloroethylene)	75-35-4	41		b	8		a
1,2-Dichloroethene (1,2-Dichloroethylene)	540-59-0	338		b	234		a
1,2-cis-Dichloroethyene	156-59-2	246		b	-		-
1,2-trans-Dichloroethylene	156-60-5	221		a	-		-
1,3-Dichloropropene	542-75-6	1.0		a	0.03		a
1,1,2,2-Tetrachloroethylene (PCE)	127-18-4	50		a	93		a
1,1,2-Trichloroethylene (TCE)	79-01-6	134		a	29		a
chloroethene (Vinyl chloride)	75-01-4	202		a	-		-
Chlorobenzenes							
Chlorobenzene	108-90-7	58		a	150		a
1,2-Dichlorobenzene	95-50-1	88		a	54		a
1,3-Dichlorobenzene	541-73-1	83		a	267		a
1,4-Dichlorobenzene	106-46-7	35		a	56		a
1,2,3-Trichlorobenzene	87-61-6	69		a	69		a
1,2,4-Trichlorobenzene	120-82-1	1,700		b	775		b
1,3,5-Trichlorobenzene	108-70-3	66		a	67		a
Trichlorobenzene (mixed isomers)	12002-48-1	66		a	67		a
Monoaromatic hydrocarbons							
1,2,3-Trimethylbenzene	526-73-8	2,074		b	-	-	-
1,2,4-Trimethylbenzene	95-63-6	92		a	645		b
1,3,5-Trimethylbenzene	108-67-8	157		a	638		b
Benzene	71-43-2	113		a	4,038		b
Cymene, p- (4-Isopropyltoluene)	99-87-6	179		a	536		b
Ethylbenzene	100-41-4	272		a	33		a
Isopropylbenzene (Cumene)	98-82-8	33		a	984		b
Styrene (Vinyl benzene)	100-42-5	116		a	1,959		b
Toluene	108-88-3	145		a	23		a
Xylenes (total)	1330-20-7	103		a	50		a
Ketones							
2-Butanone (methyl ethyl ketone)	78-93-3	992		a	631		a
2-Hexanone (methyl butyl ketone)	591-78-6	2,828		b	15		a
2-Octanone (methyl hexyl ketone)	111-13-7	4.1		a	4.1		a
4-Methyl-2-pentanone (MIBK)	108-10-1	2,712		b	21		a
Acetone	67-64-1	40		a	40		a
Other VOCs							
1-Pentanol	71-41-0	7		a	7		a
2-Propanol	67-63-0	0.11		a	0.11		a
Acetonitrile	75-05-8	560		a	5,144		b
4-Bromophenyl phenyl ether	101-55-3	46		a	46		a
Bromoform (Tribromomethane)	75-25-2	73		a	102		a
Bromomethane (methyl bromide)	74-83-9	2		a	3,107		b
Carbon disulfide	75-15-0	3.3		a	0.2		a
Dibromochloromethane	124-48-1	102		a	10.8		a

Table 2b

Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites.

for Narcotic Mode of Action

Chemical	*CAS*	*Freshwater Sediment Screening Value (µg/kg 1% OC)*		*Source*	*Marine/Estuarine Sediment Screening Value (µg/kg 1% OC)*		*Source*
		Narcosis	*Acute*		*Narcosis*	*Acute*	
Dichlorobromomethane	75-27-4	108		a	5,915		b
Ethylene glycol	107-21-1	313		a	1,921		b
Hexachloroethane	67-72-1	24		a	24		a
Hexane	110-54-3	0.8		a	0.8		a
Methanol	67-56-1	3.3		a	1,941		b
Methyl tert-butyl ether (MTBE)	1634-04-4	84		a	2,911		b
Propylene glycol	57-55-6	0.3		a	2,199		b
Tetrahydrofuran	109-99-9	1,183		a	4,372		b
Semivolatile Organic Compounds (SVOCs) - µg/kg							
Chlorobenzenes							
1,2,3,4-Tetrachlorobenzene	634-66-2	77		a	436		b
1,2,4,5-Tetrachlorobenzene	95-94-3	184		a	434		b
Hexachlorobenzene	118-74-1	0.02		a	310		b
Pentachlorobenzene	608-93-5	115		a	17.4		a
Phenols							
2,4-Dichlorophenol	120-83-2	54		a	3,885		b
2,4,6-Tribromophenol	118-79-6	45		a	-	-	-
2,3,4,6-Tetrachlorophenol	58-90-2	36		a	-	-	-
Nonylphenol	25154-52-3	1,268		a	327		a
Energetic SVOAs							
2-Nitrotoluene	88-72-2	185		a	8,315		b
3-Nitrotoluene	99-08-1	133		a	10,000		b
4-Nitrotoluene	99-99-0	131		a	9,065		b
Phthalates							
Bis(2-ethylhexyl)phthalate	117-81-7	182	2,647	c	182	2,647	c
Butyl benzyl phthalate	85-68-7	592		a	489		a
Diethyl phthalate	84-66-2	231	-	a	220	-	a
Dimethyl phthalate	131-11-3	347		a	3,000		b
Di-n-butyl phthalate	84-74-2	220	1,000	a, d	405		b
Di-n-octyl phthalate	117-84-0	39	1,100	g	-	-	-
PAHs							
1-Methylnaphthalene	90-12-0	53		a	53		a
2-Methylnaphthalene	91-57-6	105		a	1,464		b
Acenaphthene	83-32-9	378		a	679		b
Acenaphthylene	208-96-8	341		a	1,035		b
Anthracene	120-12-7	3.3		a	119		a
Benz(a)anthracene	56-55-3	4,240		b	48		a
Benzo(a)pyrene	50-32-8	125		a	434		b
Benzo(b)fluoranthene	205-99-2	4,361		b	685		b
Benzo(g,h,i)perylene	191-24-2	5,965		b	-		-
Benzo(k)fluoranthene	207-08-9	4,069		a	-		-
Chrysene	218-01-9	2,551		b	682		b
Dibenz(a,h)anthracene	53-70-3	5,702		a	-		-
Fluoranthene	206-44-0	241		a	851		b
Fluorene	86-73-7	806		a	165		a
Indeno(1,2,3-cd)pyrene	193-39-5	9,843		b	-		-
Naphthalene	91-20-3	153		a	88		a
Phenanthrene	85-01-8	384		a	768		a
Pyrene	129-00-0	790		a	615		b
Other SVOCs							
1,1-Biphenyl	92-52-4	196		a	423		b
4-Bromophenyl Phenyl Ether	101-55-3	46		a	46		a
Benzoic Acid	65-85-0	2,900	3,800	d	650	650	d
Benzyl alcohol	100-51-6	1.1	-	a	57	73	d
Carbazole	86-74-8	900	1,100	d	-	-	-
Dibenzofuran	132-64-9	150	680	a, d	139		a
Isodecyl diphenyl phosphate	29761-21-5	88		a	2,177		b

Table 2b
Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites.
for Narcotic Mode of Action

Chemical	*CAS*	*Freshwater Sediment Screening Value (µg/kg 1% OC)*		*Source*	*Marine/Estuarine Sediment Screening Value (µg/kg 1% OC)*		*Source*
		Narcosis	*Acute*		*Narcosis*	*Acute*	
Isophorone	78-59-1	418		b	-	-	-
N-Nitrosodiphenylamine	86-30-6	35		a	295		b
Nitrobenzene	98-95-3	559		a	2,199		b
Propylene glycol	57-55-6	0.3		a	2,774		b
Quinoline	91-22-5	422		b	-	-	-
Triphenyl phosphate	115-86-6	69		a	-	-	-

Table 2 Notes:

- No data available

CAS = chemical abstract service registry number

Table 2a Sources:

Red font indicates a bioaccumulative chemical.

a - Region 4 Sediment Model based on highest ranked surface water quality ESV from Table 1a (chronic water quality ESV * Koc) at 1% organic carbon.

b - Region 4 Sediment Model based on lowest predicted surface water value from 3 different models (predicted chronic water quality benchmark * Koc) at 1% OC. See text.

c - MacDonald, D.D. 1994. Approach to the Assessment of Sediment Quality in Florida Coastal Waters. Florida Department of Environmental Protection. 1994 Florida Sediment Quality Assessment Guidelines for Florida Coastal Waters.

d - Washington State Sediment Management Standards, Cleanup Objectives. http://www.ecy.wa.gov/programs/tcp/smu/sed_standards.htm

Table 2
Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites. (Organic Carbon Normalized)

Chemical	*CAS*	*Freshwater Sediment Organic Carbon normalized Final Chronic Values ($C_{oc,PAHi,FCVi}$)*	*Source*	*Marine/Estuarine Sediment Organic Carbon normalized Final Chronic Values ($C_{oc,PAHi,FCVi}$)*	*Source*
		Narcosis ESB		Narcosis ESB	
Low Molecular Weight Polycyclic Aromatic hydrocarbons (LMWPAHs) Σ					
Acenaphthene	83-32-9	491	a	16	c
Acenaphthylene	208-96-8	452	a	66	c
Anthracene	120-12-7	594	a	220	c
Fluorene	86-73-7	538	a	23	c
C1-Fluorenes	-	611	a	-	-
C2-Fluorenes	-	686	a	-	-
C3-Fluorenes	-	769	a	-	-
1-Methyl naphthalene	90-12-0	446	a	131	b
2-Methyl naphthalene	91-57-6	447	a	116	b
2,6-Dimethyl naphthalene	581-42-0	513	a	44	b
2,3,5-Trimethylnaphthalene	2245-38-7	584	a	13	b
Naphthalene	91-20-3	385	a	99	c
C1-Naphthalenes	-	444	a	-	-
C2-Naphthalenes	-	510	a	-	-
C3-Naphthalenes	-	581	a	-	-
C4-Naphthalenes	-	657	a	-	-
1-Methyl phenanthrene	832-69-9	670	a	50	b
Phenanthrene	85-01-8	596	a	100	c
C1-Phenatherene/anthracenes	-	670	a	-	-
C2-Phenatherene/anthracenes	-	746	a	-	-
C3-Phenatherene/anthracenes	-	829	a	-	-
C4-Phenatherene/anthracenes	-	913	a	-	-
LMW PAHs	-	-	-	370	c
Thiophenes Σ					
Benzothiophene	11095-43-5	569	b	226	b
Dibenzothiophene	132-65-0	1,860	b	156	b
C1-Dibenzothiophenes	-	1,146	b	-	-
C2-Dibenzothiophenes	-	898	b	-	-
C3-Dibenzothiophenes	-	664	b	-	-
C4-Dibenzothiophenes	-	466	b	-	-
Naphthothiophene	233-02-3	1,803	b	151	b
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HMWPAHs) Σ					
Benzo(a)anthracene	56-55-3	841	a	110	c
C1-Benzanthracene/chrysenes	-	929	a	-	-
C2-Benzanthracene/chrysenes	-	1,008	a	-	-
C3-Benzanthracene/chrysenes	-	1,112	a	-	-
C4-Benzanthracene/chrysenes	-	1,214	a	-	-
Benzo(b)fluoranthene	205-99-2	979	a	38	b
Benzo(k)fluoranthene	-	981	a	38	b
Benzofluoranthenes (total)	-	-	-	230	c
Benzo(g,h,i)perylene	191-24-2	1,095	a	230	c
Benzo(a)pyrene	50-32-8	965	a	31	c
Benzo(e)pyrene	192-97-2	967	a	99	b
Chrysene	218-01-9	844	a	25	c
C1-Chrysenes	-	2,028	b	110	-
C2-Chrysenes	-	1,656	b	-	-
C3-Chrysenes	-	1,087	b	-	-

Table 2
Region 4 Ecological Technical Advisory Group Sediment Screening Values for Hazardous Waste Sites.
(Organic Carbon Normalized)

Chemical	*CAS*	*Freshwater Sediment Organic Carbon normalized Final Chronic Values ($C_{oc,PAHi,FCVi}$)*	*Source*	*Marine/Estuarine Sediment Organic Carbon normalized Final Chronic Values ($C_{oc,PAHi,FCVi}$)*	*Source*
		Narcosis ESB		Narcosis ESB	
C4-Chrysenes	-	733	b	-	-
Dibenz(a,h) anthracene	53-70-3	1,123	a	12	c
Fluoranthene	206-44-0	707	a	160	c
C1-Fluoranthene/pyrenes	-	770	a	-	-
C2-Fluoranthene/pyrenes	-	1,331	b	-	-
C3-Fluoranthene/pyrenes	-	733	b	-	-
Indeno(1,2,3-cd)pyrene	193-39-5	1,115	a	34	c
Perylene	198-55-0	967	a	17	b
Pyrene	129-00-0	697	a	1,000	c
HMW PAHs	-	-	-	960	c

Notes:

ESB - Equlibrium Sediment Benchmark

a - EPA (2003). Procedures for the Derivation of Equlibrium Partitioning Sediment Benchmarks(ESBs) for the Protection of Benthic Orgamisms: Compendium of Tier 2 Values for Nonionic Organics. EPA/600/R-02/016.

b - Region 4 Sediment model using ECOSAR.

c - Washington State Sediment Management Standards, Cleanup Objectives. http://www.ecy.wa.gov/programs/tcp/smu/sed_standards.htm

Table 3

Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites.

CHEMICAL	CAS	Screening Level (mg/kg)	Ref.	Receptor	Plants	Ref.	Soil Invertebrates (mg/kg)	Ref.	Mammalian	Ref.	Avian	Ref.	Multiple Receptors	Ref.
Inorganic Compounds														
Metals														
Aluminum	7429-90-5	Narrative	a	All	-	-	Narrative	a	-	-	-	-	-	-
Antimony	7440-36-0	0.27	a	All	5	b	78	a	0.27	a	-	-	-	-
Arsenic	7440-38-2	18	a	All	18	a	60	b	46	a	43	a	-	-
Barium	7440-39-3	330	a	All	500	b	330	a	2,000	a	-	-	-	-
Beryllium	7440-41-7	10	b	All	10	b	40	a	21		-	-	4	f
Boron	7440-42-8	2	c	All	36	c	-	-	56	c	2	c	2	f
Cadmium	7440-43-9	0.36	a	All	32	a	140	a	0.36	a	0.77	a	-	-
Chromium - Total	7440-47-3	28	c	All	-	-	-	-	45	c	28	c	-	-
Chromium III	16065-83-1	18	a	All	-	-	18	a	34	a	26	a	-	-
Chromium VI	18540-29-9	0.4	f	All	0.35	c	7.8	a	81	a	190	c	0.4	f
Cobalt	7440-48-4	13	a	All	13	a	-	-	230	a	120	a	-	-
Copper	7440-50-8	28	a	All	70	a	80	a	49	a	28	a	-	-
Iron	7439-89-6	Narrative	a	All	-	-	Narrative	a	-	-	-	-	-	-
Lead	7439-92-1	11	a	All	120	a	1,700	a	56	a	11	a	-	-
Lithium	7439-93-2	2	b	P, M	2	b	-	-	38	c	-	-	-	-
Manganese	7439-96-5	220	a	All	220	a	450	a	4,000	a	4,300	a	-	-
Mercury (total)	7439-97-6	0.1	b	All	0.3	b	0.1	b	1.7	c	0.013	c	-	-
Methylmercury	22967-92-6	0.00051	b	All	0.3	b	0.1	b	0.00051	b	-	b	-	-
Molybdenum	7439-98-7	2	b	All	2	b	19	g	4.8	b	-	b	5	f
Nickel	7440-02-0	38	a	All	38	a	280	a	130	a	210	a	-	-
Selenium	7782-49-2	0.52	a	All	0.52	a	4.1	a	0.63	a	1.2	a	-	-
Silver	7440-22-4	4.2	a	All	560	a	-	-	14	a	4.2	a	-	-
Strontium	7440-24-6	96	c	M	-	-	-	-	96	c	-	-	-	-
Technetium	7440-26-8	0.2	b	P	0.2	b	-	-	-	-	-	-	-	-
Thallium	7440-28-0	1	f	All	1	b	1	g	2.1	b	-	-	1	f
Tin	7440-31-5	50	f	SI, P	50	b	125	g	-	-	-	-	50	f
Uranium	7440-61-1	23	f	All	25	c	-	-	750	c	1,600	c	23	f
Vanadium	7440-62-2	7.8	a	All	60	c	12.5	g	280	a	7.8	a	-	-
Zinc	7440-66-6	46	a	All	160	a	120	a	79	a	46	a	-	-
Other Inorganics														
Ammonia	7664-41-7													
Bromine (total)	7726-95-6	10	b	P	10	b	-	-	-	-	-	-	-	-
Cyanide (free)	57-12-5	0.1	c	SI, A	-	-	0.9	f	-	-	0.1	c	-	-
Fluoride	16984-48-8	32	c	M, A	-	-	-	-	120	c	32	c	-	-
Fluorine[+]	7782-41-4	200	f	All	200	b	200	e	-	-	-	-	200	f
Iodine	7553-56-2	4	b	P	4	b	-	-	-	-	-	-	-	-
Sulfur (elemental)	7704-34-9	500	f	All	-	-	-	-	-	-	-	-	500	f
Volatile Organic Compounds (VOCs)														
Chlorinated Alkanes														
1,1,1,2-Tetrachloroethane	630-20-6	0.07	d	SI	-	-	0.07	d	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	79-34-5	0.19	d	SI	-	-	0.19	d	-	-	-	-	-	-
1,1,1-Trichloroethane	71-55-6	0.04	d	All	-	-	0.04	d	260	c	-	-	0.1	f
1,1,2-Trichloroethane	79-00-5	0.1	f	All	-	-	0.32	d	-	-	-	-	0.1	f
1,1-Dichloroethane	75-34-3	0.1	f	All	-	-	0.14	d	210	c	-	-	0.1	f
1,2-Dichloroethane	107-06-2	0.4	d	All	-	-	0.40	d	27	c	0.85	c	0.1	f
1,2-Dichloropropane	78-87-5	0.1	f	All	-	-	0.28	d	-	-	-	-	0.1	f
Dichloromethane (Methylene chloride)	75-09-2	0.1	f	All	1,600	c	0.21	d	2.6	c	-	-	0.1	f
Trichloromethane (chloroform)	67-66-3	0.1	f	All	-	-	0.05	d	8	c	-	-	0.1	f
Tetrachloromethane (Carbon tetrachloride)	56-23-5	0.1	f	All	-	-	0.05	d	-	-	-	-	0.1	f

Table 3

Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites.

CHEMICAL	CAS	Screening Level (mg/kg)	Ref.	Receptor	Plants	Ref.	Soil Invertebrates (mg/kg)	Ref.	Mammalian	Ref.	Avian	Ref.	Multiple Receptors	Ref.
Chlorinated Alkenes														
1,1-Dichloroethene/ethylene	75-35-4	0.1	f	All	-	-	0.04	d	11	c	-	-	0.1	f
1,2-Dichloroethene (cis and trans)	540-59-0	0.1	f	All	-	-	0.04	d	23	c	-	-	0.1	f
1,2-cis-Dichloroethyene	156-59-2	0.04	d	All	-	-	0.04	d	-	-	-	-	-	-
1,2-trans-Dichloroethylene	156-60-5	0.04	d	All	-	-	0.04	d	-	-	-	-	-	-
1,3-Dichloropropene	542-75-6	0.1	f	All	-	-	0.001	d	-	-	-	-	0.1	f
Tetrachloroethene	127-18-4	0.06	d	All	-	-	0.06	d	0.18	c	-	-	0.01	e
1,1,2-Trichloroethylene (TCE)	79-01-6	0.1	f	All	-	-	0.06	d	42	c	-	-	0.1	f
Vinyl chloride	75-01-4	0.12	c	All	-	-	0.03	d	0.12	c	-	-	-	-
Chlorobenzenes														
Chlorobenzene	108-90-7	0.1	f	All	-	-	0.06	d	43	c	-	-	0.1	f
1,2-Dichlorobenzene	95-50-1	0.1	f	All	-	-	0.09	d	0.92	c	-	-	0.1	f
1,3-Dichlorobenzene	541-73-1	0.1	d	SI	-	-	0.08	d	0.73	c	-	-	-	-
1,4-Dichlorobenzene	106-46-7	0.1	f	All	-	-	0.04	d	0.88	c	-	-	0.1	f
1,2,3-Trichlorobenzene	87-61-6	0.05	d	All	-	-	0.07	d	-	-	-	-	0.05	f
1,2,4-Trichlorobenzene	120-82-1	0.27	c	All	-	-	1.4	d	0.27	c	-	-	0.05	f
1,3,5-Trichlorobenzene	108-70-3	0.05	f	All	-	-	0.07	d	-	-	-	-	0.05	f
Monoaromatic Hydrocarbons														
1,2,4-Trimethylbenzene	95-63-6	0.09	d	All	-	-	0.09	d	-	-	-	-	-	-
1,3,5-Trimethylbenzene	108-67-8	0.16	d	All	-	-	0.16	d	-	-	-	-	-	-
Benzene	71-43-2	0.12	d	All	-	-	0.12	d	24	c	-	-	1	h
Cymene, p- (4-Isopropyltoluene)	99-87-6	0.18	d	All	-	-	0.18	d	-	-	-	-	-	-
Ethylbenzene	100-41-4	0.27	d	All	-	-	0.27	d	-	-	-	-	5	h
Isopropylbenzene (Cumene)	98-82-8	0.04	d	All	-	-	0.04	d	-	-	-	-	-	-
Styrene (Vinyl benzene)	100-42-5	0.12	d	All	3.2	c	0.12	d	-	-	-	-	0.1	f
Toluene	108-88-3	0.15	d	All	200	c	0.15	d	23	c	-	-	3	h
Xylenes (total)	1330-20-7	0.1	d	All	100	c	0.10	d	1.4	c	41	c	-	-
Ketones														
2-Butanone (Methyl Ethyl Ketone)	78-93-3	1.0	d	All	-	-	1.0	d	360	c	-	-	-	-
2-Hexanone	591-78-6	0.36	c	SI, M, A	-	-	2.5	d	5.4	c	0.36	c	-	-
Acetone	67-64-1	1.2	c	M, A	-	-	0.04	d	1.2	c	7.5	c	-	-
Other VOCs														
Tribromomethane (Bromoform)	75-25-2	0.07	d	All	-	-	0.07	d	-	-	-	-	-	e
Bromomethane (methyl bromide)	74-83-9	0.002	d	All	-	-	0.002	d	-	-	-	-	-	-
Carbon Disulfide	75-15-0	0.005	d	All	-	-	0.005	d	0.82	c	-	-	-	-
Ethylene glycol	107-21-1	0.31	d	All	-	-	0.31	d	-	-	-	-	960	f
Hexachloroethane	67-72-1	0.024	d	All	-	-	0.024	d	-	-	-	-	-	-
Hexane	110-54-3	0.007	d	All	-	-	0.007	d	-	-	-	-	-	-
Tert-butyl methyl ether (MTBE)	1634-04-4	12.5	c	SI	-	-	12.5	c	-	-	-	-	-	-

Table 3

Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites.

CHEMICAL	CAS	Screening Level (mg/kg)	Ref.	Receptor	Plants	Ref.	Soil Invertebrates (mg/kg)	Ref.	Mammalian	Ref.	Avian	Ref.	Multiple Receptors	Ref.
Semivolatile Organic Compounds (SVOCs)														
Chloroanilines														
3-Chloroaniline	108-42-9	20	b	SI, P	20	b	30	b	-	-	-	-	-	-
4-Chloroaniline	106-47-8	1.0	c	SI, P	1.0	c	1.8	c	-	-	-	-	-	-
3,4-Dichloroaniline	95-76-1	20	b	SI	-	-	20	b	-	-	-	-	-	-
2,4,5-Trichloroaniline	636-30-6	20	b	SI, P	20	b	20	b	-	-	-	-	-	-
Pentachloroaniline	527-20-8	0.62	d	SI	-	-	0.62	d	-	-	-	-	-	-
Chlorobenzenes														
1,3-Dichlorobenzene	99-65-0	0.1	f	All	-	-	0.08	d	0.73	c	-	-	0.1	f
1,2,3-Trichlorobenzene	87-61-6	0.07	d	All	-	-	0.07	d	-	-	-	-	-	-
1,2,3,4-Tetrachlorobenzene	634-66-2	0.08	d	All	-	-	0.08	d	-	-	-	-	0.05	f
1,2,4,5-Tetrachlorobenzene	95-94-3	0.05	f	All	-	-	0.18	d	-	-	-	-	0.05	f
Hexachlorobenzene	118-74-1	0.05	f	All	10	c	0.001	d	0.2	c	0.079	c	0.05	f
Pentachlorobenzene	608-93-5	0.05	f	All	-	-	0.11	d	-	-	-	-	0.05	f
Dichlorophenols														
2,3-Dichlorophenol	576-24-9	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
2,4-Dichlorophenol	120-83-2	0.01	e	All	-	-	0.05	d	-	-	-	-	0.01	e
2,5-Dichlorophenol	583-78-8	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
2,6-Dichlorophenol	87-65-0	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
3,4-Dichlorophenol	95-77-2	0.01	e	All	20	b	20	b	-	-	-	-	0.01	e
3,5-Dichlorophenol	591-35-5	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
Dichlorophenols (total)	SEQ NO-35-8	0.05	f	All	-	-	-	-	-	-	-	-	0.05	f
Trichlorophenols														
2,3,4-Trichlorophenol	15950-66-0	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
2,3,6-Trichlorophenol	933-75-5	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
2,4,5-Trichlorophenol	95-95-4	0.01	e	All	4	b	0.03	d	-	-	-	-	0.01	e
2,4,6-Trichlorophenol	88-06-2	0.05	f	All	-	-	0.09	d	-	-	-	-	0.05	f
3,4,5-Trichlorophenol	609-19-8	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
Trichlorophenols (total)	-	0.05	f	All	-	-	-	-	-	-	-	-	0.05	f
Tetrachlorophenols														
2,3,4,5-Tetrachlorophenol	4901-51-3	0.01	e	All	-	-	20	b	-	-	-	-	0.01	e
2,3,4,6-Tetrachlorophenol	58-90-2	0.05	f	All	-	-	0.04	d	-	-	-	-	0.05	f
2,3,5,6-Tetrachlorophenol	935-95-5	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
Tetrachlorophenols (total)	-	0.05	f	All	-	-	-	-	-	-	-	-	0.05	f
Other Phenols														
2-Chlorophenol	95-57-8	0.06	d	All	-	-	0.06	d	0.54	c	0.39	c	0.01	e
3-Chlorophenol	108-43-0	0.01	e	All	7	b	10	b	-	-	-	-	0.01	e
4-Chlorophenol	106-48-9	0.01	e	All	-	-	-	-	-	-	-	-	0.01	e
Monochlorophenols (total)	-	0.05	f	All	-	-	-	-	-	-	-	-	0.05	f
2,4-Dimethylphenol	105-67-9	0.04	d	SI	-	-	0.04	d	-	-	-	-	-	-
2,4-Dinitrophenol	51-28-5	0.15	d	All	20	b	0.15	d	-	-	-	-	-	-
4-Nitrophenol	100-02-7	7	b	SI	-	-	7	b	-	-	-	-	-	-
2-Methylphenol (Cresol, o-)	95-48-7	0.1	d	All	0.67	c	0.1	d	590	c	-	-	0.1	f
3-Methylphenol (Cresol, m-)	108-39-4	0.1	f	All	0.69	c	0.09	d	-	-	-	-	0.1	f
4-Methylphenol (Cresol, p-)	106-44-5	0.1	f	All	-	-	0.08	d	-	-	-	-	0.1	f
Cresols (total)	-	0.1	f	All	-	-	-	-	-	-	-	-	0.1	f
Nonylphenol	25154-52-3	1.27	d	SI	-	-	1.27	d	-	-	-	-	-	-
Pentachlorophenol (PCP)	87-86-5	2.1	a	All	5	a	31	a	2.8	a	2.1	a	-	-
Phenol	108-95-2	0.13	d	All	70	b	0.13	d	38	c	-	-	-	-

Table 3

Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites.

CHEMICAL	CAS	Screening Level (mg/kg)	Ref.	Receptor	Plants	Ref.	Soil Invertebrates (mg/kg)	Ref.	Mammalian	Ref.	Avian	Ref.	Multiple Receptors	Ref.
Energetic SVOCs														
2-Amino-4,6-dinitrotoluene	35572-78-2	14	c	SI, M, P	14	c	43	c	15	c	-	-	-	-
4-Amino-2,6-dinitrotoluene	19406-51-0	12	c	SI, M, P	33	c	18	c	12	c	-	-	-	-
1,3- Dinitrobenzene	99-65-0	0.073	d	All	-	-	0.034	d	0.073	c	0.15	c	-	-
2,4-Dinitrotoluene	121-14-2	6	c	SI, M, P	6	c	18	c	13	c	-	-	-	-
2,6-Dinitrotoluene	606-20-2	4.1	c	All	-	-	30	c	4.1	c	52	c	-	-
HMX (Octahydro-tetranitro-1,3,5,7-tetrazocine)	2691-41-0	16	c	SI, M, P	2,700	c	16	c	300	c	-	-	-	-
Nitroglycerine	55-63-0	71	c	M	-	-	13	c	71	c	-	-	-	-
2-Nitrotoluene	88-72-2	0.19	d	All	-	-	0.19	d	9.9	c	-	-	-	-
3-Nitrotoluene	99-08-1	0.13	d	All	-	-	0.13	d	12	c	-	-	-	-
4-Nitrotoluene	99-99-0	0.14	d	All	-	-	0.14	d	22	c	-	-	-	-
PRTN (Pentaerythrite-tetranitrate)	78-11-5	100	c	M	-	-	-	-	100	c	-	-	-	-
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	121-82-4	8.4	c	All	-	-	8.4	c	16	c	2.3	c	-	-
Tetryl (Methyl-2,4,6-trinitrophenylnitroamine)	479-45-8	1.,5	c	M	-	-	-	-	1.5	c	-	-	-	-
1,3,5-Trinitrobenzene	99-35-4	10	c	SI, M	-	-	10	c	120	c	-	-	-	-
2,4,6-Trinitrotoluene (TNT)	118-96-7	7.6	c	All	62	c	32	c	96	c	7.6	c	-	-
Other SVOCs														
1,1'-Biphenyl	92-52-4	0.2	d	All	60	b	0.2	d	-	-	-	-	-	-
3,3'- Dichlorobenzidine	91-94-1	0.03	d	All			0.03	d	-	-	-	-	-	-
Benzoic acid	65-85-0	0.01	d	All	-	-	0.01	d	1.0	c	-	-	-	-
Benzyl Alcohol	100-51-6	0.001	d	All	-	-	0.001	d	120	c	-	-	-	-
Carbazole	86-74-8	0.16	d	All	-	-	0.16	d	80	c	-	-	-	-
Dibenzofuran	132-64-9	0.15	d	All	6.1	c	0.15	d	-	-	-	-	-	-
Hexachlorobutadiene	87-68-3	0.1	d	SI	-	-	0.1	d	-	-	-	-	-	-
Hexachlorocyclopentadiene	77-47-4	0.001	d	All	10	b	0.001	d	-	-	-	-	-	-
N-Nitrosodiphenylamine	86-30-6	0.12	d	All	-	-	0.12	d	-	-	-	-	-	-
Nitrobenzene	98-95-3	2.2	c	SI, M	-	-	2.2	c	4.9	c	-	-	-	-
Pentachloronitrobenzene	82-68-8	0.7	c	M, A	-	-	-	-	11	c	0.7	c	-	-
Phthalates														
Bis(2-ethylhexyl) phthalate	117-81-7	0.02	c	All	-	-	0.23	d	0.59	c	0.02	c	-	-
Butylbenzyl phthalate	85-68-7	0.59	d	All	-	-	0.59	d	90	c	-	-	-	-
Diethylphthalate	84-66-2	0.23	d	All	100	b	0.23	d	3,600	c	-	-	-	-
Dimethylphthalate	131-11-3	0.35	d	All	-	-	0.35	d	38	c	-	-	-	-
Di-n-butyl phthalate	84-74-2	0.011	c	All	160	c	0.22	d	180	c	0.011	c	-	-
Di-n-octyl phthalate	117-84-0	0.21	c	All	-	-	0.21	d	0.91	c	-	-	-	-

Table 3

Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites.

CHEMICAL	CAS	Screening Level (mg/kg)	Ref.	Receptor	Plants	Ref.	Soil Invertebrates (mg/kg)	Ref.	Mammalian	Ref.	Avian	Ref.	Multiple Receptors	Ref.
Polycyclic Aromatic Hydrocarbons (PAHs)														
Low Molecular Weight PAHs														
Acenaphthene	83-32-9	See Total	-	-	0.25	c	-	-	120	c	-	-	-	-
Acenaphthylene	208-96-8	See Total	-	-	-	-	-	-	120	c	-	-	-	-
Anthracene	120-12-7	See Total	-	-	6.8	c	-	-	210	c	-	-	-	-
Fluorene	86-73-7	See Total	-	-	-	-	-	-	3.7	c	-	-	-	-
1-Methyl naphthalene	90-12-0	See Total	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	91-57-6	See Total	-	-	-	-	-	-	16	c	-	-	-	-
2,6-Dimethyl naphthalene	581-42-0	See Total	-	-	-	-	-	-	-	-	-	-	-	-
2,3,5-Trimethylnaphthalene	2245-38-7	See Total	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	91-20-3	See Total	-	-	1.0	c	-	-	9.7	c	3.4	c	-	-
1-Methyl phenanthrene	832-69-9	See Total	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	85-01-8	See Total	-	-	-	-	-	-	10	c	-	-	-	-
Total LMWPAHs	-	**29**	a	All	-	-	29	a	100	a	-	-	-	-
High Molecular Weight PAHs														
Benzo(a)anthracene	56-55-3	See Total	-	-	18	c	-	-	3	c	0.8	c	-	-
Benzo(b)fluoranthene	205-99-2	See Total	-	-	18	c	-	-	38	c	-	-	-	-
Benzo(k)fluoranthene	207-08-9	See Total	-	-	-	-	-	-	62	c	-	-	-	-
Benzo(ghi)perylene	191-24-2	See Total	-	-	-	-	-	-	24	c	-	-	-	-
Benzo(a)pyrene	50-32-8	See Total	-	-	-	-	-	-	53	c	-	-	-	-
Benzo(e)pyrene	192-97-2	See Total	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	218-01-9	See Total	-	-	-	-	-	-	2.4	c	-	-	-	-
Dibenzo(a,h)anthracene	53-70-3	See Total	-	-	-	-	-	-	12	c	-	-	-	-
Fluoranthene	206-44-0	See Total	-	-	-	-	-	-	10	c	-	-	-	-
Indeno(1,2,3-cd)pyrene	193-39-5	See Total	-	-	-	-	-	-	62	c	-	-	-	-
Perylene	198-55-0	See Total	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	129-00-0	See Total	-	-	-	-	-	-	22	c	34	c	-	-
Total HMWPAHs	-	**1.1**	a	M	-	-	18	a	1.1	a	-	-	-	-

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Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites.

CHEMICAL	CAS	Screening Level (mg/kg)	Ref.	Receptor	Plants	Ref.	Soil Invertebrates (mg/kg)	Ref.	Mammalian	Ref.	Avian	Ref.	Multiple Receptors	Ref.
Pesticides/Herbicides														
Acrolein	107-02-8	0.0001	d	All			0.0001	d	-	-	-	-	-	-
Aldrin	309-00-2	0.037	c	SI, M	-	-	0.048	d	0.037	c	-	-	-	-
Atrazine	1912-24-9	0.073	d	SI	-	-	0.073	d	-	-	-	-	-	-
BHC - alpha	319-84-6	0.34	d	SI, M	-	-	0.34	d	58	c	-	-	-	-
BHC - beta	319-85-7	0.0003	c	All	-	-	0.0003	d	0.27	c	14	c	-	-
BHC - gamma (Lindane)	58-89-9	0.01	f	All	-	-	0.0013	d	0.0094	c	0.21	c	0.01	f
Carbaryl	63-25-2	0.0025	d	All	-	-	0.0025	d	-	-	-	-	-	-
Carbofuran	1563-66-2	0.0001	d	All	-	-	0.0001	d	-	-	-	-	-	-
Chlordane - alpha	5103-71-9	0.1	e	All	2.2	c	0.1	e	0.27	c	0.28	c	-	-
Chlordane - beta	5103-74-2	0.1	e	SI	-	-	0.1	e	-	-	-	-	-	-
Chlordane - gamma	12789-03-6	0.1	e	All	2.2	c	0.1	e	2.2	c	2.3	c	-	-
Chlordane	57-74-9	0.17	d	All	-	-	0.17	d	-	-	-	-	-	-
Chloropyrifos	2921-88-2	0.0035	d	All	-	-	0.0035	d	-	-	-	-	-	-
Dinoseb	88-85-7	0.0054	d	All	-	-	0.0054	d	-	-	-	-	-	-
DDD (sum 4,4- & 2,4-DDD)	50-29-3	0.044	c	All	-	-	0.0001	d	0.044	c	0.36	c	-	-
DDE (sum 4,4- & 2,4-DDE)	72-55-9	0.11	c	All	-	-	0.0038	d	3.7	-	0.11	c	-	-
DDT (sum 4,4- & 2,4-DDT)	72-54-8	0.0063	c	All	-	-	3.37	d	4.1	c	0.0063	c	-	-
DDT/DDE/DDD (total)	--	0.021	a	All	-	-	-	-	0.021	a	0.093	a	-	-
Diazinon	333-41-5	0.002	d	All	-	-	0.002	d	-	-	-	-	-	-
Dieldrin	60-57-1	0.0049	a	All	0.2	c	0.1	d	0.0049	a	0.021	a	-	-
Endosulfan - alpha	959-98-8	0.64	c	All	-	-	0.0009	d	0.64	c	15	c	-	-
Endosulfan (alpha and beta)	115-29-7	0.0009	d	All	-	-	0.0009	d	-	-	-	-	-	-
Endosulfan sulfate	1031-07-8	0.0065	d	All	-	-	0.0065	d	-	-	-	-	-	-
Endrin	72-20-8	0.0014	c	All	0.0034	c	0.025	d	0.023	c	0.0014	c	-	-
Guthion	86-50-0	0.0006	d	All	-	-	0.0006	d	-	-	-	-	-	-
Heptachlor	76-44-8	0.059	c	All	0.4	c	0.29	d	0.059	c	0.3	c	-	-
Heptachlor epoxide	1024-57-3	0.0004	d	All	-	-	0.0004	d	-	-	-	-	-	-
Hexachlorocyclopentadiene	77-47-4	0.0008	d	All	-	-	0.0008	d	-	-	-	-	-	-
Kepone (Chlordecone)	143-50-0	0.021	c	All	-	-	17	d	0.021	c	1.3	c	-	-
Malathion	121-75-5	0.0001	d	All	-	-	0.0001	d	-	-	-	-	-	-
Methoxychlor	72-43-5	0.0025	d	All	-	-	0.0025	d	5	c	18	c	-	-
Mirex	2385-85-5	0.014	d	All	-	-	0.014	d	-	-	-	-	-	-
Parathion	56-38-2	0.0005	d	All	-	-	0.0005	d	-	-	-	-	-	-
2,4,5-TP (Silvex)	93-72-1	12	d	SI	-	-	12	d	-	-	-	-	-	-
Simazine	122-34-9	0.00	d	All	-	-	0.00	d	-	-	-	-	-	-
Toxaphene	8001-35-2	0.38	d	All	-	-	0.38	d	5.9	c	4.1	c	-	-
Trifluralin	1582-09-8	0.00	d	All	-	-	0.0002	d	-	-	-	-	-	-

Table 3
Region 4 Ecological Technical Advisory Group Soil Screening Values for Hazardous Waste Sites.

CHEMICAL	CAS	Screening Level (mg/kg)	Ref.	Receptor	Plants	Ref.	Soil Invertebrates (mg/kg)	Ref.	Mammalian	Ref.	Avian	Ref.	Multiple Receptors	Ref.
Polychlorinated Biphenyls (PCBs) and Dioxins/Furans														
PCDDs, PCDFs (ΣTEQ)	1746-01-6	4 ng/kg	f	All	-	-	0.0088	d	-	-	-	-	4 ng/kg	f
PCBs (sum) (Wildlife Based)	1336-36-3	0.33	d	All	40	b	0.33	d	-	-	-	-	0.5	f
Aroclor-1016	12674-11-2	1.0	c	All	-	-	-	-	1.0	c	-	-	-	-
Aroclor-1242	53469-21-9	0.014	c	All	-	-	-	-	0.38	c	0.041	c	-	-
Aroclor-1248	12672-29-6	0.0072	c	All	-	-	-	-	0.0072	c	0.041	c	-	-
Aroclor-1254	11097-69-1	0.014	c	All	160	c	-	-	0.88	c	0.041	c	-	-
Aroclor-1260	11096-82-5	0.14	c	All	-	-	-	-	0.14	c	0.88	c	-	-
Other														
2-Nitroaniline	88-74-4	5.4	c	M	-	-	-	-	5.4	c	-	-	-	-
Diphenylamine	122-39-4	10	c	M, A	-	-	-	-	10	c	73	c	-	-
Tetrahydrothiophene	110-01-0	0.1	e	All	-	-	0.88	g	-	-	-	-	0.1	e
Trichlorofluoromethane	75-69-4	52	c	M	-	-	-	-	52	c	-	-	-	-
Organotins (total)	-	1.2	g	SI	-	-	1.2	g	-	-	-	-	-	-

All - ESV for protection of all receptors
A - ESV for protection of Avians
M - ESV for protection of Mammals
P - ESV for protection of Plants
SI - ESV for protection of soil invertebrates

LMWPAHs have less than 4 rings
HMWPAHs have 4 or more rings

Table 3 Sources:

a - USEPA (2007): Ecological Soil Screening Levels. http://www.epa.gov/ecotox/ecossl/

b - Oak Ridge National Laboratory:
Efroymson, R.A., M.E. Will, and G.W. Suter. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: [illegible]
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National Laboratory, Oak Ridge, TN. ES/ER/TM-85/R3. http://www.esd.ornl.gov/programs/ecorisk/documents/tm85r3.pdf
Efroymson, R.A., G.W. Suter, II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints. Oak Ridge National Laboratory, Oak Ridge, TN. 50 pp. ES/ER/TM-162/R2

c - Los Alamos National Laboratory (LANL). 2012. ECORISK Database Release 3.1. Environmental Programs, Engineering and Technology Division. October 2012.
http://www.lanl.gov/community-environment/environmental-stewardship/protection/eco-risk-assessment.php

d - ECOSAR & Region 4 soil model

e - Beyer, W. N. 1990. Evaluating Soil Contamination, United States Fish and Wildlife Service, Biological Report 90 (2). July 1990.

f - CCME. 2002. Canadian Environmental Quality Guidelines. Canadian Counsil of Ministers of the Environment, Winnipeg, Manitoba. http://st-ts.ccme.ca/

g -Swartjes, F.A., M. Rutgers, J.P.A. Lijzen, P.J.C.M. Janssen, P.F. Otte, A. Wintersen, E. Bans, L. Posthuma. 2012. State of the art of contaminated site management in the Netherlands: Policy framework and risk assessment tools. *Science of the Total Environment* 427-428:1-10. Ecologically based, risk limit, intervention value divided by 10.

h - Australia Department of Environment and Conservation. Assessment Levels for Soil, Sediment and Water. Contaminated Sites Management Series. February 2010.

TABLE 4. Sampling and Analysis Plan
Church House Branch CMS
International Paper
Closed Former Wood Treating Units, Wlggins, MS
EPA ID No. MSD 980 600 084

Sample Type/Matrix	Location	Sample IDs	Sample Depth (feet)	Sampling Method	Analysis	Analytical Method	Lab	QA/QC Samples	Comments
Discrete Soil	Drainage Ditches 1, 2, 3 and 4	SOIL1 SOIL2 SOIL3 SOIL4 SOIL5	0-0.5	SS Trowel	PCP PAHs Metals TOC Grain Size	EPA 8270 EPA 8270 EPA 6000 EPA 9060 ASTM E112-13	ALS	SOIL DUP SOIL EB SOIL MS SOIL MSD	See Figure 1 for sample locations
Discrete Sediment	Church House Branch	SD1 SD2 SD3 SD4 SD5 SD6 SD7 SD8 SD9 SD10 SD11	0-0.5	Coring Device, SS Trowel, Shovel	PCP PAHs Metals TOC Grain Size	EPA 8270 EPA 8270 EPA 6000 EPA 9060 ASTM E112-13	ALS	SD DUP SD EB SD MS SD MSD	See Figure 1 for sample locations
Discrete Surface Water	Church House Branch	SW1 SW2 SW3 SW4	0-1	Sample Bottle	PCP PAHs Metals Hardness	EPA 8270 EPA 8270 EPA 6000 EPA 6010	ALS	SW DUP SW EB SW MS SW MSD	See Figure 1 for sample locations

NOTES:

Surface water samples will be collected in accordance with "Dirty Hands/Clean Hands" protocol, before sediment sampling

Metals - As, Cr, Cu, see analytes list in Table 3

PCP - Pentachlorophenol, see analytes list in Table 3

PAHs - Polycyclic Aromatic Hydrocarbons, see analytes list in Table 3

DUP - Field duplicate sample MS/ MSD - Matrix Spike / Matrix Spike Duplicate EB - Equipment Blank QA/QC - Quality Assurance/Quality Control

Grain Size - one field sample/media

TABLE 4. Sampling and Analysis Plan
Church House Branch CMS
International Paper
Closed Former Wood Treating Units, Wlggins, MS
EPA ID No. MSD 980 600 084

Sample Type/Matrix	Location	Sample IDs	Sample Depth (feet)	Sampling Method	Analysis	Analytical Method	Lab	QA/QC Samples	Comments

SITE AND PROJECT INFORMATION:

Site Name and Address: International Paper, Closed Former Wood Treating Units, Wiggins, MS
Site Contact: Baldwin Pole Mississippi LLC, Pam Jackson, EHS Manager, 602-928-5475, 601-528-3503 cell, pam@baldwinpole.com
Client Contact: International Paper, Brent Sasser, PE,470-297-4254, 901-413-6890 cell, brent.sasser@ipaper.com
EarthCon Project Manager: Doug Seely, 770-973-2100 ext 2906, 781-363-3219 cell, dseely@earthcon.com
EarthCon Field Team Leader: Laura Sanchez, 770-973-2100 ext 2355, 985-788-4821 cell, lsanchez@earthcon.com
EarthCon Site Safety Officer: Laura Sanchez, 770-973-2100 ext 2355, 985-788-4821 cell, lsanchez@earthcon.com
EarthCon Corporate Health and Safety Manager: Doris Boyd, 770-973-2100 ext. 2610, 901-359-1996 cell, dboyd@earthcon.com
EarthCon Principal Geologist: Norman D. Kennel, PG, 770-973-2100, 901-619-6822 cell, nkennel@earthcon.com
EarthCon Data Validator: Kathy Gunderson, 360-942-8927, 360-942-8927 cell, kgunderson@earthcon.com
Sample Courier: Federal Express, 800-463-3339, EarthCon Account No. 233628255
Laboratory Address: ALS, 9143 Phillips Highway, Suite 200, Jacksonville, FL 32256
Laboratory Contact: Jerry Allen, 904-394-4410, jerry.allen@alsglobal.com

Prepared by: DES 5/16/15
Checked by: KJG 5/20/15

TABLE 5. QA/QC Plan
Church House Branch CMS
International Paper
Closed Former Wood Treating Units, Wiggins, MS
EPA ID No. MSD 980 600 084

Field Activity	Field Sample Locations	Sample Depth (feet)	QA/QC Samples	Analytical Parameter	No. of Samples	Analytical Method	Target Reporting Limit	Sample Bottles	Sample Preservation	Holding Times
Discrete Soil Sampling	SOIL1 SOIL2 SOIL3 SOIL4 SOIL5	0-0.5	SOIL DUP SOIL EB SOIL MS SOIL MSD	8270 - PCP	9	EPA 8270	2.1 ug/kg	1-4 oz. glass	<4C	14 days - extraction 40 days - analysis
				8270 - PAHs			1-4 ug/kg			
				Metals	9	EPA 6000	As 0.115 mg/kg Cr 0.019 mg/kg Cu 0.060 mg/kg	1-4 oz. glass	<4C	6 months
				TOC	9	EPA 9060	200 mg/kg	1-4 oz. glass	<4C	28 days
				Grain Size	1	ASTM E112-13	NA	1-4 oz. glass	<4C	NA
Discrete Sediment Samples	SD1 SD2 SD3 SD4 SD5 SD6 SD7 SD8 SD9 SD10 SD11	0-0.5	SD DUP SD EB SD MS SD MSD	8270 - PCP	15	EPA 8270	2.1 ug/kg	1-4 oz. glass	<4C	14 days - extraction 40 days - analysis
				8270 - PAHs			1-4 ug/kg			
				Metals	15	EPA 6000	As 0.115 mg/kg Cr 0.019 mg/kg Cu 0.060 mg/kg	1-4 oz. glass	<4C	6 months
				TOC	9	EPA 9060	200 mg/kg	1-4 oz. glass	<4C	28 days
				Grain Size	1	ASTM E112-13	NA	1-4 oz. glass	<4C	NA
Surface Water Samples	SW1 SW2 SW3 SW4	0-1	SW DUP SW EB SW MS SW MSD	8270 - PCP	8	EPA 8270	0.04 ug/L	3-1 L amber glass	<4C	7 days - extraction 40 days - analysis
				8270 - PAHs			0.044 ug/L			
				Metals	8	EPA 6000	As 0.42 ug/L Cr 0.18 ug/L Cu 0.22 ug/L	1-8 oz. glass	<4C	6 months
				Hardness	8	EPA 6010	100 ug/L	1-8 oz. glass	<4C	6 months

NOTES:

Surface water samples will be collected in accordance with "Dirty Hands/Clean Hands" protocol, before sediment sampling
Standard analytical turnaround is up to 15 business days for PCP, PAHs, Metals
Surface Water and sediment samples will be collected starting downstream then moving upstream, surface water samples will be collected first at each location
PCP - Pentachlorophenol, see analytes list in Table 3
PAHs - Polycyclic Aromatic Hydrocarbons, see analytes list in Table 3
Metals - As, Cr, Cu, see analytes list in Table 3
Target Reporting Limits are listed for wet weight, actual reporting limits will be higher relative to the moisture content of the sample.
< - less than, oz - ounce, ml - milliliters, mg/Kg - milligram/Kilogram, ug/Kg - microgram/Kilogram, mg/L 0 milligram/liter, ug/L - microgram/liter
DUP - Field duplicate sample MS/ MSD - Matrix Spike / Matrix Spike Duplicate EB - Equipment Blank QA/QC - Quality Assurance/Quality Control
NA - Not applicable

Prepared by: DES 5/16/15
Checked by: KJG 5/20/15

TABLE 6. Sample Analytes
Church House Branch CMS
International Paper
Closed Former Wood Treating Units, Wlggins, MS
EPA ID No. MSD 980 600 084

	Soil		Water	
Sample Analytes	MDL	Units	MDL	Units
Semivolatile Organic Compounds				
Pentachlorophenol	2.1	µg/Kg	0.039	µg/L
Polycyclic Aromatic Hydrocarbons				
2-Methylnaphthalene	2.3	µg/Kg	0.044	µg/L
Acenaphthene	3.1	µg/Kg	0.041	µg/L
Acenaphthylene	2.2	µg/Kg	0.025	µg/L
Anthracene	1.6	µg/Kg	0.038	µg/L
Fluorene	2.2	µg/Kg	0.047	µg/L
Naphthalene	3.1	µg/Kg	0.039	µg/L
Phenanthrene	1.7	µg/Kg	0.035	µg/L
Benzo(a)anthracene	1.9	µg/Kg	0.035	µg/L
Benzo(a)pyrene	1	µg/Kg	0.031	µg/L
Benzo(b)fluoranthene	2	µg/Kg	0.025	µg/L
Benzo(g,h,i) perylene	2.2	µg/Kg	0.039	µg/L
Chrysene	1.9	µg/Kg	0.024	µg/L
Fluoranthene	2	µg/Kg	0.039	µg/L
Indeno(1,2,3-c)pyrene	2.2	µg/Kg	0.040	µg/L
Pyrene	2	µg/Kg	0.031	µg/L
Benzo(k)fluoranthene	2.4	µg/Kg	0.035	µg/L
Dibenz(a,h)anthracene	2.7	µg/Kg	0.036	µg/L
Metals				
Arsenic	0.115	mg/Kg	0.418	µg/L
Chromium	0.0191	mg/Kg	0.175	µg/L
Copper	0.0602	mg/Kg	0.222	µg/L
General Chemistry				
Total Organic Carbon	200	mg/Kg	NA	NA
Grain Size	NA	NA	NA	NA
Hardness	NA	NA	100	µg/L

NOTES:
MDL - Method detection limit
NA - Not applicable
µg/Kg - microgram/Kilogram
µg/L - micorgram/Liter

Prepared by: DES 5/18/15
Reviewed by: KJG 5/20/15

Note: *SOPs 002 and 003 cited within.*

SOP 001
SAMPLE CUSTODY

A stringent, established program of sample chain-of-custody will be followed during sample storage and shipping activities to account for each sample. The procedure outlined herein will be used in conjunction with SOP 003, which covers the use of sample logbooks, and SOP 002, which covers sample packaging and shipping. Chain-of-custody record/sample analysis request forms (Attachment 001-1) ensure that samples are traceable from the time of collection through processing and analysis until final disposition. A sample is considered to be in a person's custody if any of the following criteria are met:

1. The sample is in the person's possession
2. The sample is in the person's view after being in possession
3. The sample is in the person's possession and is being transferred to a designated secure area
4. The sample has been locked up to prevent tampering after it was in the person's possession.

PROCEDURE

The chain-of-custody record portion of the form is the most critical because it documents sample possession from the time of collection through the final disposition of the sample. The sample analysis request portion of the form provides information to the laboratory regarding what analyses are to be performed on the samples that are shipped.

The chain-of-custody record/sample analysis request form will be completed after each field collection activity and before the samples are shipped to the laboratory. Sampling personnel are responsible for the care and custody of the samples until they are shipped. When transferring possession of the samples, the individuals relinquishing and receiving the samples must sign the chain-of-custody record/sample analysis request form(s), indicating the time and date that the transfer occurs. Copies of the forms will be made and kept by the sampler, and the originals will be included with the samples in the transfer container. The following guidelines will be followed to ensure consistent shipping procedures and to maintain the integrity of the samples:

1. Each chain-of-custody record/sample analysis request form must be appropriately signed and dated by the sampling personnel. The person who relinquishes custody of the samples must also sign this form.

2. The chain-of-custody record/sample analysis request form should not be signed until the information has been checked for inaccuracies by the lead sampler. All changes should be made by drawing a single line through the incorrect entry and initialing and dating it. Revised entries should be made in the space below the entries. On the handwritten chain-of-custody record/sample analysis request forms, spaces remaining at the bottom of the page after corrections are made should be marked out with single lines. This procedure will preclude any unauthorized additions.

3. At the bottom of each chain-of-custody record/sample analysis request form is a space for the signatures of the persons relinquishing and receiving the samples and the time and date that the transfer occurred. The time that the samples were relinquished should match exactly the time they were received by another party. Under no circumstances should there be any time when custody of the samples is undocumented.

4. If samples are sent by a commercial carrier not affiliated with the laboratory, such as Federal Express or UPS, the name of the carrier and airbill should be recorded on the chain-of-custody record/sample analysis request form. The time of transfer should be as close to the actual drop-off time as possible. After the chain-of-custody record/sample analysis request forms are signed and copied, they should be sealed inside the transfer container.

5. If errors are found after the shipment has left the custody of sampling personnel, a corrected version of the forms must be prepared and sent to all relevant parties. Minor errors can be rectified by making the change on a copy of the original with a brief explanation and signature. Errors in the signature block may require a letter of explanation.

6. Samples that are archived internally should be accompanied by a chain-of-custody record/sample analysis request form. While samples remain in the sampler's custody before being shipped, all containers will be kept in sight of sampling personnel or in a secured area to preclude tampering with the samples.

Note: *SOPs 001 and 003 cited within.*

SOP 002
SAMPLE PACKAGING AND SHIPPING

Specific requirements for sample packaging and shipping must be followed to ensure the proper transfer and documentation of environmental samples collected during field operations. Procedures for the careful and consistent transfer of samples from the field to the laboratory are outlined herein.

EQUIPMENT REQUIRED

Specific equipment or supplies necessary to properly pack and ship environmental samples include the following:

- Ice in sealed bags or Blue Ice®
- Sealable airtight bags
- Plastic garbage bags
- Coolers
- Bubble wrap
- Fiber reinforced packing tape
- Scissors
- Chain-of-custody seals
- Airbills for overnight shipment
- Chain-of-custody record/sample analysis request forms.

PROCEDURE

The following steps should be followed to ensure the proper transfer of samples from the field to the laboratories:

1. Appropriately document all samples using the proper logbooks (see SOP 003) and chain-of-custody record/sample analysis request forms (example provided in Attachment 002-1).

2. Make sure all applicable laboratory quality control sample designations have been made on the chain-of-custody record/sample analysis request forms. Samples that will be archived for future possible analysis should be clearly identified on the chain-of-custody record/sample analysis request form and should also be labeled as "Do Not Analyze: Hold and archive for possible future analysis" as some laboratories interpret "archive" to mean continue holding the residual sample after analysis.

3. Notify the laboratory contact and the project QA/QC coordinator that samples will be shipped and the estimated arrival time. Send copies of all chain-of-custody record/sample analysis request forms to the QA/QC coordinator or project manager, as appropriate.

4. Samples will be placed in secure onsite storage or remain in the possession of the sampling personnel prior to shipment. Any temporary sample storage areas will be locked and secured to maintain sample integrity and chain-of-custody requirements.

5. Clean the outside of all dirty sample containers to remove any residual material that may lead to cross-contamination.

6. Fill out the chain-of-custody/sample analysis request form as described in SOP 001, and retain the back copy of the form for the project records prior to sealing the cooler. Store the signed chain-of-custody record/sample analysis request forms in a sealable bag and tape them to the inside of the cooler lid. For a shipment containing multiple coolers, indicate on the outside of this cooler "Chain-of-Custody Inside."

7. Check sample containers against the chain-of-custody record/sample analysis request form to ensure all samples intended for shipment are accounted for.

8. Store each sample container in a sealable bag that allows the sample label (example provided in Attachment 002-1) to be read. Volatile organic analyte (VOA) vials for a single sample must be encased in bubble wrap before being sealed in bags.

9. Choose the appropriate size cooler (or coolers) and line with bubble wrap.

10. Fill the cooler with the samples, separating glass containers with bubble wrap and allowing room for ice to keep the samples cold. Add enough ice or Blue Ice® to keep the samples refrigerated overnight. Ice should be enclosed in sealable plastic bags to prevent leakage. Avoid separating the samples from the ice with excess bubble wrap because it will insulate the containers from the ice. After all samples and ice have been added to the cooler, use bubble wrap to fill any empty space to keep the samples from shifting during transport.

11. If possible, consolidate all VOA samples in a single cooler, and ship them with (a) trip blank(s) in accordance with the quality assurance project plan.

12. After the cooler is sufficiently packed to prevent shifting of the containers, close the lid and seal it shut with fiber-reinforced packing tape. If the cooler has a drain at the bottom, it should be taped shut in the same manner.

13. As security against unauthorized handling of the samples, apply one or two chain-of-custody seals across the opening of the cooler lid (example provided in Attachment 002-1). Be sure the seals are properly affixed to the cooler so they are not removed during shipment.

14. Label the cooler with destination and return addresses, and add other appropriate stickers, such as "This End Up," "Fragile," and "Handle With Care."

15. If an overnight courier is used, fill out the airbill as required and fasten it to the top of the cooler. The identification number sticker should be taped to the lid, because tracking problems can occur if a sticker is removed during shipment.

SOP 003
FIELD DOCUMENTATION

All information relevant to field operations must be properly documented to ensure that activities are accounted for and can be reconstructed from written records. Field documentation should include only a factual description of site-related activities and observations made. Field personnel should not include superfluous comments or speculation regarding the field activities or observations made. Several types of logbooks may be used for this purpose and should be consistently used by field crews (e.g., field logbooks, sample logbooks, field data logbooks). Logbooks will be labeled on the cover with the project name, dates of field work, and the Purchase Order number (or other number assigned by IP). A separate bound logbook with consecutively numbered pages will be used for each field project. Each logbook for a particular project will be numbered (e.g., *Project Name* Remedial Investigation—Field Logbook *Number 2*).

The information recorded in each logbook should be written in indelible ink. All corrections should consist of a single line-out deletion, followed by the author's initials and the date. Field logbooks will be photocopied after each period in the field, and photocopies will be stored in the project files. After field activities are completed, logbooks will be stored in the permanent project file. No bound logbooks should be discarded, even if they are illegible or contain inaccuracies that require a replacement document. When not in use, all logbooks will be stored in the permanent project file.

FIELD LOGBOOKS

The purpose of the field logbook is to document events that occur and record data measured in the field to the extent that someone not present at the site can reconstruct the activity without relying on the memory of the field crew. Each page in the field logbook will be initialed and dated by all persons making entries on that page. The author will sign and date the last page at the end of each day, and a line will be drawn through the remainder of the page. The logbooks, at a minimum, must contain the following information:

1. A purpose and description of the field task
2. The time and date the field work began
3. The location and description of the work area, including sketches, map references, and photograph log, if appropriate
4. The names and titles of field personnel and anyone present during the field work, including the times they are present

5. The name, agency, and telephone number of any field contacts
6. The meteorological conditions at the beginning of the field work and any changes that occur throughout the day, including the approximate time of the change
7. Details of the field work performed, with a description of any deviations from the work plan, sampling and analysis plan, or standard operating procedures
8. All field measurements made (unless a specific logbook or sampling form [i.e., borehole log or groundwater sampling form] is available for this purpose), including the time of measurement
9. Any field results not appearing in the field data logbook, including station identification and location, date, and time of measurement
10. Cross-references of numbers for duplicate samples
11. References to other logbooks used to record information (e.g., station log, sample log, health and safety log)
12. Logbooks should include only a factual description of site-related activities. Field personnel should not include superfluous comments, speculation, or other non-factual observations regarding the field activities.

SAMPLE COLLECTION FIELD FORMS

Appropriate sample collection field forms will be used to record the relevant sample information during a sampling event. For instructions regarding proper use of sample identifiers, sampling personnel should consult the sampling and analysis plan.

SAMPLE LABELS

Sample labels (tags) are designed to uniquely identify each sample, and must be affixed to each sample container used. The labels should be filled out at the time the samples are collected and should consist of the following information:

1. Sample number
2. Site name
3. Date and time sample is collected
4. Initials of the samplers
5. Preservatives used, if any
6. Type of analysis (e.g., EPA Method 8260B).

PHOTOGRAPHS

In certain instances, photographs of sampling stations may be taken using a camera-lens system with a perspective similar to the naked eye. Photographs should include a measured scale in the picture, when practical. The following items should be recorded in the field logbook for each photograph taken:

1. The photographer's name, the date, the time of the photograph, and the general direction faced (orientation)
2. A brief description of the subject and the field work portrayed in the picture
3. The sequential number of the photograph and the roll number on which it is contained
4. If digital photographs are collected for internal use or presentation purposes, the file name, date, file location, description, orientation, and photograph should be recorded.

The slides, prints, or disks (as appropriate) and associated negatives will be placed in the project files after the film is developed. Any supporting documentation from the field logbooks will be photocopied and placed in the task files to accompany the slides, prints, or disks.

EQUIPMENT CALIBRATION RECORDS

Equipment calibration records, including instrument type and serial number, calibration supplies used, calibration methods and calibration results, date, time, and personnel performing the calibration, should be recorded in the field logbook. At a minimum, equipment used during the investigation should be calibrated daily in accordance with the manufacturers' recommendations.

SOP 004 DECONTAMINATION OF SOIL AND WATER SAMPLING EQUIPMENT

To prevent potential cross-contamination of samples, all reusable soil and water sampling equipment and pumps will be decontaminated. The lead sampler will set up the area used to decontaminate soil and water sampling equipment consisting of three stations, as described below. Where practicable, this area will be located upwind from the specific sampling area and upwind from process areas that could skew sample results. The personnel performing the decontamination procedures will wear protective clothing as specified in the site-specific Site Health and Safety Plan.

This SOP describes procedures for decontaminating sampling equipment contaminated by either inorganic or organic materials. Sampling equipment used for both can combine these procedures, following the order of a detergent wash, organic solvent, acid rinse, and final water rinse. At stations where both water and soil (or other solid media) will be sampled, separate decontamination areas should be used for each medium where appropriate.

When using a drilling contractor, subsurface soil samplers (i.e., split spoons, Dames & Moore U-type samplers, core barrels, and SPTs) can be decontaminated by using a heated pressure washer (steam cleaner). The decontaminated sampler(s) (if not to be used immediately) will be stored in a plastic bag or wrapped in aluminum foil until ready for use. Storage of sampling equipment must be consistent with the project data quality objectives and analytical parameters must be considered (e.g., storage in plastic bags is not recommended when analyzing samples for phthalates).

EQUIPMENT REQUIRED TO DECONTAMINATE INORGANIC-CONTAMINATED SAMPLING EQUIPMENT

Equipment:

- 3-gal plastic tubs
- 5-gal plastic container, tap water
- 5-gal carboy laboratory-grade distilled/deionized (DS/DI) water (organic/analyte-free)
- Properly labeled spray bottles for decontamination solvents
- Alconox® (or equivalent)
- normal nitric acid

- Hard-bristle brushes
- Plastic sheeting, garbage bags, and aluminum foil
- Personal protective equipment as specified in the Health and Safety Plan
- 55-gal drum(s)
- Drum labels.

PROCEDURES USED TO DECONTAMINATE INORGANIC-CONTAMINATED SAMPLING EQUIPMENT

The specific procedures for decontaminating inorganic-contaminated soil sampling equipment include the following:

1. At Station No. 1, first wash the contaminated equipment in a tub containing tap water mixed with a detergent such as Alconox®. Only a small volume (0.5 teaspoon) of Alconox® is necessary, and all Alconox® crystals should be completely dissolved.
2. Move the equipment to the wash tubs at Station No. 2. First, rinse the equipment with potable water, followed by rinsing equipment with 0.1 Normal nitric acid (HNO_3) or similar acid, then rinse with DS/DI water.
3. At Station No. 3, place the clean equipment on plastic sheeting until reuse.

After decontaminating all the sampling equipment, the disposable gloves, and used plastic from Station No. 3 will be placed in garbage bags and disposed of. The wash and rinse water from Station Nos. 1 and 2 will be containerized for proper disposal. At the end of each day, all sampling equipment will be stored in large plastic bags.

EQUIPMENT REQUIRED TO DECONTAMINATE ORGANIC-CONTAMINATED SAMPLING EQUIPMENT

- 3-gal plastic tubs
- 5-gal plastic container, tap water
- 5-gal carboy laboratory analyte-free DS/DI water
- Properly labeled spray bottles for decontamination solvents
- Aluminum foil
- Alconox® (or equivalent)

- Hard-bristle brushes
- Pesticide-grade acetone, hexane, and methanol
- Plastic sheeting and garbage bags
- Personal protective equipment as specified in the Health and Safety Plan.

PROCEDURES USED TO DECONTAMINATE ORGANIC-CONTAMINATED SAMPLING EQUIPMENT

The specific procedures for decontaminating the organic-contaminated soil and groundwater sampling equipment include the following:

1. At Station No. 1, first wash the contaminated equipment in a tub containing tap water mixed with a detergent such as Alconox®. Only a small volume (0.5 teaspoon) of Alconox® is necessary, and all Alconox® crystals should be completely dissolved.
2. At Station No. 1, Tub No. 2, double rinse the equipment with site or DS/DI water.
3. At Station No. 2, rinse the equipment with a pesticide-grade organic solvent (e.g., hexane, if appropriate to remove oily contamination) followed by a rinse with acetone or methanol (drying agent). These solvents should be captured in a separate container and allowed to evaporate. Station No. 2 should be placed in a well-ventilated area.
4. At Station No. 3, double rinse the equipment with DS/DI water.
5. At Station No. 4, lay the equipment on clean aluminum foil to air dry.
6. Wrap the equipment in clean aluminum foil until reuse.

The disposable gloves and used foil from Station No. 3 will be placed in garbage bags and disposed of. The wash and rinse waters from Station Nos. 1 and 2 will be disposed of properly.

EQUIPMENT USED TO DECONTAMINATE SAMPLING PUMP

- Submersible pumps
- Alconox® (or equivalent)
- Tap water
- Hard-bristle brushes

- Plastic sheeting and garbage bags
- 30-gal plastic trash can or plastic overpack drum
- 55-gal drum(s)
- Hot-water pressure washer (optional).

PROCEDURES USED TO DECONTAMINATE SAMPLING PUMPS

The specific procedures used for decontaminating sampling pumps include the following:

1. It is advisable to begin sampling with the well or surface water stations containing the lowest anticipated analyte concentration. Successive samples should be obtained from wells or stations anticipated to have increasing analyte concentrations. Use of dedicated pump equipment is preferable when feasible.
2. When pumps (e.g., submersible, bladder) are submerged below the water surface to collect water samples, they should be cleaned and flushed between uses. This cleaning process consists of an external detergent wash and rinse, or hot-water pressure washing of pump casing, tubing, and cables, followed by a flush of potable water through the pump. This flushing can be accomplished by pumping approximately 10 gal of an Alconox® solution through the pump and then pumping approximately 10 gal of tap water through the pump. This should be followed by rinsing the external parts of the pump intake hose and cable with a tap-water rinse, and finally with a DI/DS-water rinse. The procedure should be repeated after sampling from each monitoring well location. The pump and hose should always be placed on clean polyethylene sheeting or in a plastic bag to avoid contact with the ground surface.
3. Surface pumps (e.g., peristaltic) used for well evacuation and surface water sampling need not be cleaned between well locations unless trace metal clean sampling techniques are required. However, a new length of polyethylene and Pharmed® (or equivalent) tubing must be used for each well and discarded after use.

Note: *SOPs 004 and 202 cited within.*

SOP 201
SOIL SAMPLE COLLECTION

SURFACE SOIL SAMPLING

The following procedures are designed to be used to collect surface soil samples. Soil samples should be collected from areas having lower levels of constituents of interest first, followed by stations with higher expected levels of constituents of interest. The procedures listed below may be modified in the field by the agreement of the lead site sampler and field personnel, based on field and site conditions, after appropriate annotations have been made in the appropriate field logbook. If specialized sampling methods (e.g., ENCORE® are to be used, refer to the manufacturer's recommended procedures). Record all pertinent information on the soil sampling Field Data Form (Attachment 201-1).

EQUIPMENT

- Stainless-steel scoop or trowel or plastic disposable sampling tool
- Laboratory-supplied sample containers
- Field logbook
- Surface soil field collection form.

PROCEDURES

1. Locate the sampling point as directed in the work plan or SAP. Containers will be labeled with sample tags prior to filling. If analytical testing will be performed for volatile organic compounds (VOCs), the VOC sample will be collected first (with a minimum of disturbance) by placing the sample into the container with a minimum amount of headspace and sealed tightly.
2. Expose the soil surface by clearing an approximately 1-ft^2 area at the sampling site of any rocks or organic material greater than approximately 3 in. in size. Note any material removed from the sampling site in the field notebook.
3. Using a decontaminated stainless-steel or disposable plastic sampling tool, excavate soil to the depth specified in the work plan or SAP.

4. If required for analysis, first collect VOC samples (prior to any homogenization), placing the samples in the appropriate-size containers.
5. Place additional sample material in a decontaminated plastic or stainless-steel mixing bowl.
6. Thoroughly mix and homogenize the sample using disposable equipment or a decontaminated stainless-steel spoon.
7. Rocks that are greater than 0.5 in. in diameter may be discarded from the homogenized soil after they are positively identified and their percentage contribution to the homogenized soil volume has been determined and noted in the field notebook.
8. Remove samples of the homogenized soil from the mixing dish and place in the appropriate size sample container. The sample container should be filled with soil to just below the container lip, and the container should be sealed tightly.
9. Complete all pertinent field QA/QC documentation, logbooks, sample labels, and field data sheets.
10. Mark the sampling site with a wire flag, wooden stake, metal rebar, or flagging, as appropriate.
11. Decontaminate all sampling equipment (SOP 004).
12. Package and ship samples according to procedures in the QAPP.

SUBSURFACE SOIL SAMPLING

The following procedures are designed to be used during the general operation of drilling rigs. The procedures listed below may be modified in the field by the agreement of the lead site sampler and drill operators, based on field and site conditions, after appropriate annotations have been made in the field logbook.

PROCEDURES

1. Locate the site as directed in the work plan or SAP. Containers will be labeled with sample tags prior to filling. If analytical testing will be performed for VOCs, the VOC sample will be collected first (with a minimum of disturbance) by placing the sample into the container with a minimum amount of headspace and sealed tightly.
2. Before drilling commences, instruct drilling rig operator as to depth of first sample to be collected and drilling interval between samples.

3. After driving the split-tube sampler, macrocore, or other sampling device its entire length or upon refusal of advancement, recover the sampler.

4. After recovery of the sampler, open the sampler.

5. If required for analysis, first collect VOC samples (prior to any homogenization), placing the samples in the appropriate-size containers.

6. Log the subsurface material as described in SOP 202; sample based on the appropriate work plan or SAP instructions.

7. Place the additional sample material in a decontaminated plastic or stainless-steel mixing bowl.

8. Thoroughly mix and homogenize the sample using a decontaminated plastic or stainless-steel spoon.

9. Rocks that are greater than 0.5 in. in diameter may be discarded from the homogenized soil after they are positively identified and their percentage contribution to the homogenized soil volume has been determined and noted in the field notebook.

10. Remove samples of the homogenized soil from the mixing dish and place in the appropriate size sample container. The sample container should be filled with soil to just below the container lip, and the container should be sealed tightly.

11. Complete all pertinent field QA/QC documentation, logbooks, sample labels, and field data sheets.

12. Complete the appropriate field books and QA/QC documentation. Photograph core with appropriate orientation, depth, and site markers visible in the photograph, if applicable.

13. Decontaminate all sampling equipment (SOP 004).

EQUIPMENT-EXCAVATED TEST PITS

The following procedures are to be used during the excavation of pits with construction equipment (backhoes) prior to soil sampling operations. Adhere to all requirements of the site safety plan for this specific activity. The procedures listed below may be modified in the field by agreement of the lead site sampler and field personnel, based on field and site conditions, after appropriate annotations have been made in the field logbook.

1. Locate the site as directed in the work plan or SAP.

2. Select the appropriate orientation for the excavation. This will be based on the judgment of the lead field sampler and on site conditions. The sampler(s) MUST remain in visual contact with the backhoe operator at all times, and

out of possible “pinch zones” or areas where heavy equipment may move or swing.

3. Begin pit excavation. Place excavated materials a sufficient distance from the pit so that excavated materials do not slough into the pit.

4. Continue excavation of the pit to the required depth. If pit entry is necessary, this depth will not exceed 4 ft from the ground surface. Never enter a trench or pit if unstable conditions exist. The proper pit exit trenches, shoring, and sloping will be excavated to prevent accidental burial of sampling crew, and will meet or exceed all OSHA Construction Standards (29 CFR § 1926; Attachment 201-2) for entrance by sampling personnel. If pit entry is not necessary for sampling activities, pit depth can exceed 4 ft bgs. Soil samples will be collected from the middle of the backhoe bucket.

5. If pit entry is necessary, sampling personnel may enter the pit only after all excavation is complete and the excavation is deemed safe to occupy by the site safety supervisor.

6. Soil profile descriptions will be made from a hand-cleaned surface along the pit wall using the appropriate field classification system and profile sheets as defined in the work plan or SAP.

7. If analytical testing will be performed for VOCs, the VOC sample will be collected first (with a minimum of disturbance) by placing the sample into the container with a minimum amount of headspace and sealed tightly.

8. Using a decontaminated stainless-steel or disposable sampling tool, excavate soil as specified in the work plan or SAP.

9. Place the additional sample material in a decontaminated plastic or stainless-steel mixing bowl.

10. Thoroughly mix and homogenize the sample using disposable equipment or a decontaminated stainless-steel spoon.

11. Rocks that are greater than 0.5 in. in diameter may be discarded from the homogenized soil after they are positively identified and their percentage contribution to the homogenized soil volume has been determined and noted in the field notebook.

12. Remove samples of the homogenized soil from the mixing dish and place in the appropriate size sample container. The sample container should be filled with soil to just below the container lip, and the container should be sealed tightly.

13. Complete all pertinent field QA/QC documentation, logbooks, sample labels, and field data sheets.

14. Complete all pertinent field QA/QC documentation, logbooks, sample labels, profile sheets, and field site sheets prior to backfilling the pit.

15. After items 1 through 8 have been completed to the satisfaction of the lead sampler, the site pit will be backfilled with the materials that were previously excavated.

16. Mark the pit with a wire flag, wooden stake, or metal rebar. Decontaminate all sampling equipment (SOP 004).

SOP 401
SURFACE WATER SAMPLING

Information regarding surface water sampling is presented below. Samples can be collected from storm drains, rivers, lakes, or ponds. Record all pertinent information on the surface water sampling Field Data Form (Attachment 401-1).

EQUIPMENT REQUIRED

- Water sample containers
- Vacuum hand pump with disposable filtration units (if applicable).

PROCEDURE

1. Submerse sample bottle in water, mouth pointing upstream and below the water surface. Take care not to collect any streambed solids disturbed by wading.
2. If volatile organic compound (VOC) analysis is required, collect samples for VOCs using a precleaned unpreserved glass sample bottle. Transfer the contents of the sample bottle to 40-mL volatile organic analyte (VOA) vials making absolutely certain that there are no bubbles adhering to the sides or top of the VOA container and that there is no headspace in the container. Be sure to check that the condition of samples is acceptable in the VOA containers before leaving each sampling site. If any air bubbles are present, the VOA sample must be retaken using a fresh sample container.
3. If field filtration for dissolved metals is required, collect samples using a hand pump apparatus and transfer to the appropriate sample bottles.
4. Perform field water quality measurements according to the sampling and analysis plan (SAP).

***Note**: SOPs 400 and 004 cited within*

SOP 430
SEDIMENT SAMPLE COLLECTION

The following information describes general procedures for the collection of sediment samples. Where possible, sampling should be conducted first in areas least affected by constituents of interest, followed by increasingly affected areas. Exploratory grab samples should be collected in order to fine-tune sampling locations in the field due to unforeseen site conditions, such as lack of suitable sediment for sampling. As silts and clays are much more physically, chemically, and biologically interactive than larger grained particles due to their unbalanced electrical charges and greater surface area to volume ratios, the grab sample should contain, as a goal, more than 30% fine-grained silts or clays (<0.06 mm) or smaller particle sizes by volume for an acceptable sample.

Sediment grabs for lab analyses; specifically, pH, total organic carbon (TOC) and particle grain sizes are collected as a minimum effort. Information and general instructions for field measurement of water quality parameters (pH, oxidation-reduction potential (ORP), specific conductance, dissolved oxygen (DO), salinity, total hardness, turbidity and temperature) are as per SOP 400. Depth profiles (at least surface, mid-depth, bottom) for these parameters should be made in waters that are too deep to wade. Due to the variety and complexity of water quality meters available, calibration and measurement procedures should be conducted in accordance with manufacturer's recommendations for specific meters used.

All instruments must be calibrated before any samples are collected. All portable units must be calibrated with one or more calibration standards. A logbook/record must be properly maintained to indicate which instrument or meter is calibrated, date of calibration, standard concentration, age of standards and field personnel. Good quality control requires a known standard be used to check the calibration before the sampling event. All field instruments should have a written standard operating procedure for each piece of equipment that ensures consistent calibration requirements and proper maintenance.

Equipment

- Physicochemical field instruments, calibration solutions, deionized distilled water for multimeters, spectrophotometers, and/or turbidimeters, instrument SOPs, and data collection forms
- Stainless-steel Petite Ponar dredge, Ekman grab and/or lined stainless-steel hand corer; extra weights and/or extra corer inserts; extra rope
- PID/FID

- Munsell color chart
- Digital depth sounder and/or calibrated wading staff for depth measurements
- Open-reel fiberglass tape for channel width measurements
- Flow meter for stream velocity measurements
- Depth-integrated sampler (DIS) for water samples at depth
- Sampling bucket and/or churn splitter for surface water sample
- Stainless-steel or glass compositing container(s)/bowl(s) and mixing spoon(s)
- Water and sediment sample containers, self-sealing plastic bags, labels, markers, and clear tape for sealing container labels
- Distilled and deionized water wash bottles
- Distilled and deionized water for field blanks
- Sediment field blank
- Sample cooler(s) and ice
- Wash, rinse and decontaminations buckets
- Wash, rinse, and decontamination supplies – see SOP 004
- Waste solvent/acid collection container
- Towels/cleanup supplies
- Plastic trash bags
- Appropriate safety supplies
- Chest waders
    - Personal flotation devices (PFDs)
    - Shoulder-length neoprene gloves
    - Latex, neoprene or rubber gloves
    - First aid kit
    - Eye wash bottle
    - Rescue throw rope
- Site documentation equipment and supplies
    - GPS unit

- Field notebook
- Digital camera
- Sampling data forms (on waterproof paper) – see Sediment Field Data Collection Sheet (Attachment 430-1) and Physicochemical Surface Water Field Data Sheet (Attachment 400-1)
- Maps (topographic preferable) with sample locations marked
- Sampling/work plan photocopy (on waterproof paper)

PROCEDURE

Bathymetric Survey/Initial Reconnaissance

Reconnaissance can often identify field limitations in the study design that can be addressed prior to sample collection. An initial reconnaissance should include a cursory bathymetric survey using a wading staff in shallow streams and rivers or an echosounding (sonar) depth sounder for deeper waters. Local knowledge or recent navigation charts (United States Geological Survey (USGS) surveys or Army Corps of Engineers (ACOE) harbor/waterway soundings in navigable waters) often provide similar information to an echosounding survey.

1. The starting point of the survey should be at a location that is readily identifiable in the field and that can be found and used at a later date to reproduce the sampling.

2. Echo sounding surveys for lakes and large rivers should be made from boats by moving slowly along parallel lines perpendicular to the river current and noting the reading on the depth finder. The proposed sampling area should be equally divided into 10 transects with depth readings taken continuously or at least every 10 feet along the transects.

3. Operation of the depth finder should be in accordance with the manufacturer's instructions and resolution of the sounder should be set for the expected depth of the water. Sensitivity of the depth finder can be set to determine relative densities of the bottom.

4. The data from the survey should be recorded in field notes and the deepest area used for sample site selection.

5. In medium sized rivers, the river can be waded or a boat used to determine the deepest sites using a calibrated staff.

6. If bathymetric information is not available, finer-grained sediments are usually located in still, deep waters of the sample area, at stream margins, behind boulders and other obstructions, or at inside bends of river meanders. Samples from free flowing rivers or streams should be collected from:

- Both banks of a relatively straight section of a stream or;
- On the inside edges of a meander or;
- In slack water or eddy current areas.

7. In navigation channels and rivers and depending on the data quality objectives (DQOs), samples should be collected far from the center of the dredged portion of the channel/river on alternating sides of the channel/river.

8. On medium sized and smaller rivers and streams, the use of hands, feet, fingers and toes with the "Wading Braille" technique (locating sediments by touch and feel) in conjunction with best professional judgment can be extremely effective in locating fine-grained deposits.

9. Contaminant source investigations in lakes should be biased towards the down current side of littoral drift. Any contaminant source investigation should be biased towards sampling sediments in the most likely sink.

Exploratory Grab Sampling/Estimating Particle Size Percentages

Collection of exploratory grab samples should be used to revise sampling location in the field due to unforeseen site conditions such as lack of suitable sediment for sampling, thereby adapting the sampling design while still meeting the data quality objectives of the study. A goal of sediment collection is > 30% by volume silt and clay in the sediment sample. If these sediment types are not found, then it should be noted on the sediment field collection data sheets.

1. The percentage of silts and clays in a sample can be estimated in the field by marking a clear jar with two lines: the first line should be near the top, and the second 30% of the way up to the first line.

2. Fill the jar to the top line with sediment and vigorously shake the jar and set aside to settle (allowing a one inch headspace in the jar allows for easier mixing).

3. After settling for 10 minutes, an estimate of the particle size distribution can be made with a visual inspection of the sediment stratification in the jar.

4. If the fines stop below the 30% line, then the silt/clay fraction is likely to be <30%.

5. If exploratory grab samples do not meet the criteria for the objectives of the study or the site contains more than 70 percent sand or larger particles, the location should be abandoned and another location chosen.

6. If no other suitable location meets the criteria, then a sample may be collected, but the results of the analysis should be annotated in the report with a description of the sample.

Field Screening

The use of field screening devices such as head space analysis with Photo Ionization Detectors (PID) and Flame Ionization Detectors (FID) is encouraged for intensive sampling programs. A preliminary screening program or "phased approach" can give direction as to where more intensive sampling is needed and can give insight as to the types of analyses that may or may not be needed for subsequent sampling phases. Field screening devices have different sensitivities to different compounds; in general, PIDs are more useful for detection of chlorinated and aromatic compounds while FIDs are more useful for aliphatic compounds.

1. To use this technique, an aliquot of sample is placed in a glass jar and covered with aluminum foil. After the atmosphere in the jar has reached equilibrium with the sediment, the PID or FID probe tip is inserted into the jar through the aluminum foil and the measurements recorded.

2. Action level criteria for head space analysis results should be specified in the data quality objectives section of the sampling plan. Head space analysis tests must be performed only by personnel specifically trained in the use of these instruments.

Shallow Water and Deepwater Sediment Sampling

In synoptic surveys, the most upstream or reference sediment site should be collected first to reduce chances of contamination between sites. If the sediment sampling locations are located within a short distance of each other, then the most downstream sample should be collected first to avoid contamination from disturbance and resuspension of sediment due to sampling activities.

Shallow Water Wading and Deepwater Boat Sampling

While wading in shallow water, the sediment collector should be standing on the downstream side of the collection site. Care should be taken to create the least disturbance to the sampling site as possible especially from wading or disturbance of the sediment from currents induced by wading.

When sampling from a boat, all engines should be turned off. The samples should be collected upstream from the engines or any other machinery that may release exhaust fumes/oils into the sample.

Standard Surface Grab Collection with Scoops and Spoons

Scoops and spoons are usually the easiest surface sediment sampler to use and are able to sample nearly every sediment type. Both are used to collect sediment samples primarily from shallow waters. Attaching a scoop or spoon to telescoping poles allows for collection of sediments in deeper waters. The disadvantages to using a scoop or spoon are that they collect limited sample volumes, there is possible loss of very fine material during retrieval, and they are not useable in waters deeper than 4-5 feet. If any of these disadvantages preclude the sediment sample from meeting data quality objectives, a different sampling device must be used.

1. Locate the sampling point as directed in the work plan or SAP.

2. Using a decontaminated stainless-steel scoop or spoon, feel the substrate with a minimum of disturbance with the spoon or scoop and quickly find appropriate material for sample collection. Avoid sampling in areas of aquatic vegetation where macrophyte roots or other vegetation may be collected.

3) Take care to minimize the loss of extremely fine material during retrieval of the scoop through the water column or through current.

4) Decant as much water as possible from the sample prior to placement into the collection pan or bowl, taking care, however, to avoid loss of extremely fine material from the sample during decanting.

5) Place sample in a decontaminated stainless-steel or glass container, such as a mixing bowl.

6) Make a physical description and photograph, if possible, of the undisturbed sample.

7) Observe sediment sample for water content and the presence of leaves, rocks, twigs, larger roots and other undesirable materials. If the water content and/or the amount of undesirable materials appear excessive, replace the sample back into the stream in a location down-gradient of the sampling location, and collect another sample.

8. If analytical testing will be performed for volatile organic compounds (VOCs), the VOC sample will be collected first as discrete grabs, should not be composited or homogenized, and is placed into the sample container with a minimum amount of headspace and sealed tightly. Containers will be labeled with sample tags prior to filling and should be filled according to the following sequence: Grab samples for VOC analysis first, followed by composite samples for BNA's, Pesticides/PCB's, nutrients, metals and particle size.

9) For composite samples, the number of grab samples collected for the composite should be noted. A minimum of three to five subsamples

(grabs) as near the same volume as possible from a site should be taken and placed in the mixing container.

10) When all grab samples have been collected, thoroughly mix and homogenize the sample using disposable equipment or a decontaminated stainless-steel or glass spoon. Continuously mix the sample to prevent stratification from occurring.

11) All stones greater than 0.5-in in diameter, shells, detritus, roots and other foreign matter should be removed and discarded from the homogenized sediment after they are positively identified and their percentage contribution to the homogenized sediment volume has been determined and noted in the field logbook.

12) Once mixed, make a physical description and photograph of the sample.

13) Remove samples of the homogenized sediment from the mixing dish and place into an appropriate-sized sample container. The sample container should be filled with sample to just below the container lip, and the container should be sealed tightly.

14) Complete all pertinent field QA/QC documentation, logbooks, sample labels, and field data sheets.

15) Decontaminate all sampling equipment, as per SOP 004.

16) Package and ship samples according to procedures in the QAPP.

Standard Surface Grab Collection with Grabs and Dredges

Surface sediment samplers (grabs and dredges) are standard for some sampling purposes (such as benthic infauna) and are relatively easy to operate. Disadvantages to the use of surface sediment samplers (grabs and dredges) include: shallow depth of penetration; possible shock wave and loss of very fine grained surface deposits; potential for water column contamination and nearby down current sediment redeposition; loss of depth profile; inappropriate for waters with current; larger materials such as twigs and stones prevent jaw closure; probable loss of some water soluble and volatile organic compounds; and it is possible to dilute the toxic pore water with relatively clean surface water (which is important when conducting sediment bioassays). If any of these disadvantages preclude the sediment sample from meeting data quality objectives, a different sampling methodology must be used.

1. Locate the sampling point as directed in the work plan or SAP.

2. Avoid sampling in areas of aquatic vegetation where macrophyte roots or other vegetation may be collected.

3. Lower the sampler through the water column with special care taken the last few feet to minimize dispersal of fine material due to a sampler-induced shock wave. NEVER ALLOW THE GRAB OR DREDGE TO FREE-FALL INTO THE SUBSTRATE.

4. In shallow waters, attach an extension handle into an Eckman dredges, thereby allowing the sampler to be plunged into the sediment.

5. Trip the sampler (petite Ponar by retrieving the sampler; Ekman by pushing into the sample in shallow water or with a messenger in deep water applications).

6. Raise the sampler slowly through the water column to minimize the loss of extremely fine material.

7. Decant as much water as possible from the sample prior to placement into the collection pan or bowl, taking care, however, to avoid loss of extremely fine material from the sample during decanting.

8. If an insufficient sample is collected, additional weights should be added (if appropriate) to the sampler to allow deeper penetration into the sediment. If additional weights do not help in the collection of a sample, then the sampling equipment and techniques should be reevaluated for the type of sediment encountered.

9. If a sufficient sample is collected, place sample in a decontaminated stainless-steel or glass container, such as a mixing bowl.

10. Make a physical description and photograph, if possible, of the undisturbed sample.

11. Observe sediment sample for water content and the presence of leaves, rocks, twigs, larger roots and other undesirable materials. If the water content and/or the amount of undesirable materials appear excessive, replace the sample back into the stream in a location down-gradient of the sampling location, and collect another sample.

12. If analytical testing will be performed for volatile organic compounds (VOCs), the VOC sample will be collected first as discrete grabs, should not be composited or homogenized, and is placed into the sample container with a minimum amount of headspace and sealed tightly. Containers will be labeled with sample tags prior to filling and should be filled according to the following sequence: Grab samples for VOC analysis first, followed by composite samples for BNA's, Pesticides/PCB's, nutrients, metals and particle size.

13. For composite samples, the number of grab samples collected for the composite should be noted. A minimum of three to five subsamples (grabs) as near the same volume as possible from a site should be taken and placed in the mixing container.

14. When all grab samples have been collected, thoroughly mix and homogenize the sample using disposable equipment or a decontaminated stainless-steel or glass spoon. Continuously mix the sample to prevent stratification from occurring.

15. All stones greater than 0.5-in in diameter, shells, detritus, roots and other foreign matter should be removed and discarded from the homogenized sediment after they are positively identified and their percentage contribution to the homogenized sediment volume has been determined and noted in the field logbook.

16. Once mixed, make a physical description and photograph of the sample.

17. Remove an aliquot of the homogenized sediment from the mixing dish and place into an appropriate-sized sample container. The sample container should be filled with sample to just below the container lip, and the container should be sealed tightly. The aliquot is submitted as the sample for the site subsamples.

18. Complete all pertinent field QA/QC documentation, logbooks, sample labels, and field data sheets.

19. Decontaminate all sampling equipment, as per SOP 004.

20. Package and ship samples according to procedures in the QAPP.

Standard Core Collection with Corers

Sediment corers can collect samples at depth and can maintain a more representative vertical profile of the sediment stratigraphy. In addition, they create less disturbance by shock waves and can collect more highly consolidated deposits. Disadvantages to the use of sediment corers are that they do not work well with sandy sediments, manual corers are limited to fairly shallow waters, and they collect limited sample volume and a very small surface area. If any of these disadvantages preclude the sediment sample from meeting data quality objectives, a different sampling methodology must be used.

1. Locate the sampling point as directed in the work plan or SAP.

2. If appropriate, place liner inside decontaminated stainless-steel sediment corer (inserts made of plastic should not be used when collecting samples for organic analysis).

3. Slowly lower corer to the substrate (release gravity corers at the water surface and allow to free fall) and simply allow corer to penetrate the sediment under the samplers own weight or when pushed or vibrated (vibro-core samplers) into the sediments. Avoid sampling in areas of aquatic vegetation where macrophyte roots or other vegetation may be collected.

4. Take care to minimize the loss of extremely fine material during retrieval of the corer through the water column or through current.

5. Decant or siphon as much water as possible from the corer prior to extruding core, taking care to avoid loss of extremely fine material from the sample during siphoning or decanting.

6. Upon retrieval, disassemble the corer (e.g., split spoons, some core tips unscrew); or cores will either drop out or can be pushed out with a clean rod from simple tube corers, corers with liners, and most other corers; or cut plastic or thin-walled metal corers to remove sediment core whole.

7. Lay the sample core in a decontaminated container or a prepared decontaminated surface for further processing.

8. Make a physical description and photograph, if possible, of the undisturbed sample.

9. Observe sediment core for water content and the presence of leaves, rocks, twigs, larger roots and other undesirable materials. If the water content and/or the amount of undesirable materials appear excessive, replace the core back into the stream in a location down gradient of the sampling location, and collect another sample.

10. If a shallow sediment core, remove top (0 – 6 –in) and place sample in a decontaminated stainless-steel or glass container, such as a mixing bowl. If a deep sediment core, caps ends of core liner, secure with tape, place entire segment into a self-sealing plastic bag, label and send to the analytical lab as per the procedures outlined in the QAPP.

11. If analytical testing will be performed for volatile organic compounds (VOCs), the VOC sample will be collected first as discrete grabs, should not be composited or homogenized, and is placed into the sample container with a minimum amount of headspace and sealed tightly. Containers will be labeled with sample tags prior to filling and should be filled according to the following sequence: Grab samples for

VOC analysis first, followed by composite samples for BNA's, Pesticides/PCB's, nutrients, metals and particle size.

12. For composite samples, the number of core samples collected for the composite should be noted. A minimum of three to five subsamples (cores) as near the same volume as possible from a site should be taken and placed in a decontaminated stainless steel or plastic basin.

13. When all cores have been collected, thoroughly mix and homogenize the sample using disposable equipment or a decontaminated stainless-steel or glass spoon. Continuously mix the sample to prevent stratification from occurring.

14. All stones greater than 0.5-in in diameter, shells, detritus, roots and other foreign matter should be removed and discarded from the homogenized sediment after they are positively identified and their percentage contribution to the homogenized sediment volume has been determined and noted in the field logbook.

15. Once mixed, make a physical description and photograph of the sample.

16. Remove samples of the homogenized sediment from the mixing dish and place into an appropriate-sized sample container. The sample container should be filled with sample to just below the container lip, and the container should be sealed tightly.

17. Complete all pertinent field QA/QC documentation, logbooks, sample labels, and field data sheets.

18. Decontaminate all sampling equipment, including inserts prior to sampling between sample locations, as per SOP 004.

19. Package and ship samples according to procedures in the QAPP.

Compositing

Care is taken to avoid spilling fines and interstitial water during mixing, and thoroughly homogenized sample is uniform in color, consistency and water content. All composite samples should be identified as to the method of sample collection, depth and volume of each discrete sample and the number of samples per composite. Sampling equipment and supplies do not have to be cleaned between subsamples of a composite sample at a site; however, equipment and supplies must be decontaminated and cleaned between station replicate sample collection and collections at different sites.

The preferred composition of the compositing container(s) varies with the analyses: plastic containers for metals analyses; stainless-steel containers for organics analyses; and glass or solid Teflon containers for all types of analyses.

Sample Preservation

All sediment samples for chemical, physical and bioassay analysis should be cooled to 4 degrees Celsius as soon as possible after collection.

Holding Times

Sediment samples for organic analysis should be extracted within 14 days. Sediment samples for metals, except for mercury, must be analyzed within six months. Sediment samples for mercury and nutrients must be analyzed within 28 days.

Appendix B
Photographic Log

EARTHCON
Environmental Challenges
BUSINESS SOLUTIONS

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
International Paper	Wiggins,MS	20020008.15

Photo No.	Date:
1	6/8/15

Description:
Location of Surface Water Sample SW-5

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
2	6/8/15

Description:
Location of Surface Water Sample SW-4

Location of Sediment Sample SD-10

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
3	6/8/15

Description:
Location of Surface Water Sample SW-3

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
4	6/8/15

Description:
Location of Surface Water Sample SW-2

Location of Sediment Sample SD-3

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
5	6/8/15

Description:
Location of Surface Water Sample SW-1

Location of Sediment Sample SD-1

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
6	6/9/15

Description:
Location of Sediment Sample SD-11

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
7	6/9/15

Description:
Location of Sediment Sample SD-10

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
8	6/9/15

Description:
Location of Sediment Sample SD-9

Client Name:	Site Location:	Project No.
International Paper	Wiggins,MS	20020008.15

Photo No.	Date:
9	6/9/15

Description:
Location of Sediment Sample SD-8

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
10	6/8/15

Description:
Location of Sediment Sample SD-7

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
11	6/9/15

Description:
Location of Sediment Sample SD-6

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
12	6/8/15

Description:
Location of Sediment Sample SD-5

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
13	6/8/15

Description:
Location of Sediment Sample SD-4

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
14	6/8/15

Description:
Location of Sediment Sample SD-2

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

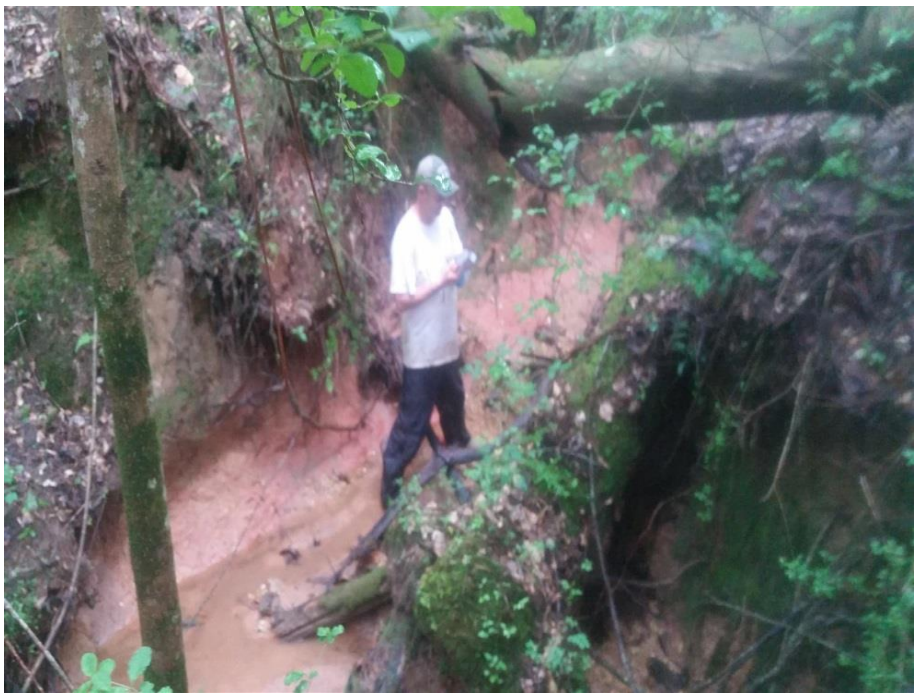
Photo No.	Date:
15	6/9/15

Description:
Location of Soil Sample
Soil-5

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
16	6/9/15

Description:
Location of Soil Sample
Soil-3



Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
17	6/9/15

Description:
Location of Soil Sample
Soil-2

Client Name:	Site Location:	Project No.
International Paper	Wiggins, MS	20020008.15

Photo No.	Date:
18	6/9/15

Description:
Location of Soil Sample
Soil-1

Appendix C
Chain-of-Custody Sheets

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

ALS Environmental

9143 Philips Highway, Ste 200 • Jacksonville, FL 32256 (904) 739-2277 • 800-695-7222 x06 • FAX (904) 739-2011

SR#

CAS Contract

Project Name: IP Wiggins Church House	Project Number: Branch CMS 02.20020008.15
Project Manager: Doug Seely	Email Address: dseely@earthcon.com
Company/Address: EarthCon Consultants, Inc 411 A. Highland Ave #377 Somerville, MA 02144	
Phone #: 781-363-3219	FAX #: 866-263-0098
Sampler's Signature: Laura D Sanchez	Sampler's Printed Name: Laura D. Sanchez

ANALYSIS REQUESTED *(Include Method Number and Container Preservative)*

CLIENT SAMPLE ID	LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NUMBER OF CONTAINERS	PCP-8270	PAHs-8270C SIM	Total Metals 6000	Hardness-SM2340B	PAHs-8270 SIM	TOC-9060	Metals EPA 6000	REMARKS/ ALTERNATE DESCRIPTION
PRESERVATIVE						0	0	2	2	0	0	0	
SW-1		6/8/15	1805	SW	4	X	X	X	X				
SW-2			1740		1	X	X	X	X				
SW-3			1650		1	X	X	X	X				
SW-4			1530		1	X	X	X	X				
SW-5			1435		1	X	X	X	X				
SW-6			1750		1	X	X	X	X				
SW-MS/MSD			1810		1	X	X	X	X				
SD-10		6/9/15	1005	SD	1	X				X	X	X	
SD-9			1010		1	X				X	X	X	
SD-8			1015		1	X				X	X	X	
SD-7			1025		1	X				X	X	X	

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other _____

SPECIAL INSTRUCTIONS/COMMENTS

See QAPP ☐

TURNAROUND REQUIREMENTS
_____ RUSH (SURCHARGES APPLY)
_X_ STANDARD
REQUESTED FAX DATE
_____
REQUESTED REPORT DATE
_____

REPORT REQUIREMENTS
_____ I. Results Only
_____ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
_____ III. Results + QC and Calibration Summaries
_____ IV. Data Validation Report with Raw Data
_____ V. Specialized Forms / Custom Report
Edata _____Yes _____No

INVOICE INFORMATION
PO # EarthCon Consultants
BILL TO: 1880 West Oak Pkwy
Bldg 100 Ste 106
Marietta, GA 30062
Attn: Accts Payable

SAMPLE RECEIPT: CONDITION/COOLER TEMP: CUSTODY SEALS: Y N

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
Signature: Laura D Sanchez	Signature	Signature	Signature	Signature	Signature
Printed Name: Laura D. Sanchez	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: EarthCon	Firm	Firm	Firm	Firm	Firm
Date/Time: 6/10/15 1200	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

Distribution: White - Return to Originator; Yellow - Retained by Client

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BUSINESS SOLUTIONS ®

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MEMORANDUM

DATE: July 10, 2015
TO: Doug Seely, EarthCon Consultants
FROM: Kathy J. Gunderson, Senior Scientist
SUBJECT: Data Quality Review
PROJECT: IP, Supplemental CMDS, Closed Former Wood Treatment Facility, Wiggins, Mississippi
RE: Surface Water, Soil, and Sediment Samples Collected June 2015
PROJECT #: 02.20020008.15

1.0 Introduction

This memorandum presents the data quality review of the analytical results of eleven sediment samples, five soil samples, five surface water samples, three field duplicates, and two equipment blanks collected June 8 and 9, 2015 as part of the Corrective Measures Study at the Closed Former Wood Treatment faculty in Wiggins, Mississippi. The samples were analyzed for polycyclic aromatic hydrocarbons (PAHS), pentachlorophenol (PCP), total metals, and total organic carbon (TOC) by the methods listed in **Table 1**. The samples were analyzed by ALS Environmental (ALS) of Jacksonville, Florida.

The quality assurance criteria used to assess the data are from the Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA 1994), the Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 1999), the analytical methods, or the professional judgment of the validation chemist. The target detection limits are from the Supplemental CMS Field Sampling Plan (EDD 2015). The following laboratory deliverables were evaluated during the review process:

- Chain-of-custody (COC) documentation to assess holding times and verify report completeness

- Laboratory quality control (QC) sample results, including method blanks, surrogate spikes, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), and laboratory duplicates

- Field QC samples to assess equipment and trip blank contamination and field duplicate precision

Field duplicate precision is presented in **Table 2** and the qualified data are summarized in **Table 3**. Tables are located at the end of this memorandum. Data qualifier flags have been added the hardcopy laboratory reports used for validation and the project data tables.

2.0 Data Validation Findings

2.1 Custody, Preservation, and Completeness – Acceptable with Discussion

Sample custody was maintained as required from sample collection to receipt at the laboratory. The samples were received intact and were properly preserved. The report is complete and, with two exceptions, contains results for all samples and tests requested on the COC forms.

- Equipment rinse blank samples SD-EB and Soil EB were not analyzed for PAH or PCP. Due to an oversight, sample containers were not provided by the laboratory for these analyses.

2.2 Polycyclic Aromatic Hydrocarbons and Pentachlorophenol Analyses

2.2.1 Holding Times – Acceptable

The samples were extracted within the method-specified holding times of 14 days from collection for soil/sediment samples and seven days from collection for water samples. The sample extracts were analyzed within the method-specific holding time of 40 days from extraction.

2.2.2 Blank Analyses – Acceptable

2.2.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per extraction batch. Target analytes were not detected in the method blanks above the method detection limits (MDLs).

2.2.2.2 Equipment Blanks

Equipment rinse blank were not collected for PAHs or PCP.

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2.2.3 Surrogate Analyses – Acceptable with Discussion

Surrogate compounds were added to all samples, blanks and QC samples as required. The recovery values are within the laboratory control limits with one exception.

- The p-terphenyl-d_{14} recovery in sample Soil 5 is below than the laboratory limits of 41 to 146 percent at 36 percent. Following Functional Guidelines protocols, data qualifiers are not required when only one of three surrogate recovery values is outside criteria.

2.2.4 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per extraction batch. The recovery values are within the laboratory control limits.

2.2.5 Matrix Spike/Matrix Spike Duplicate Analyses – Acceptable with Qualification

MS/MSD analyses were performed at the required frequency of one pair per extraction batch. With the exceptions noted below, the recovery and relative percent difference (RPD) values are within the laboratory control limits.

- For the MS/MSD analysis of sample Soil 2, the MSD and RPD values of fluoranthene and pyrene are outside the laboratory control limits. Data qualifiers are not required for the high MSD recovery because, in both cases, the MS recovery values are acceptable. The fluoranthene and pyrene results of sample Soil 2 are qualified as estimated (J) due to the imprecision of the MS/MSD.

- The PCP MS and MSD recovery values in the spiked analyses of sample Soil 2 are above the laboratory control limits of 10 to 100 percent at 113 and 208 percent. Data quality is not affected because the native sample concentration overwhelms the amount spiked by a factor of 12. Data qualifiers are not required.

- The PCP MS and MSD recovery values in the spiked analyses of sample SD-5 are below the laboratory control limits of 10 to 100 percent at 20 and 43 percent. Data quality is not affected because the native sample concentration overwhelms the amount spiked by a factor of six. Data qualifiers are not required.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 2	Fluoranthene	J	MS/MSD RPD above laboratory limits
Soil 2	Pyrene	J	MS/MSD RPD above laboratory limits

2.2.6 Laboratory Reporting Limits – Acceptable with Discussion

Target constituents and detection limits are listed in Table 6 of the Field Sampling Plan. PCP and the correct list of PAHs were reported. With one exception, the water MDLs are below the Region 4 Surface Water Screening Values for chronic exposure. The soil and sediment MDLs are below the Region 4 Ecological Technical Advisory Group Soil Screening Values.

- The MDLs listed in Table 6 of the Field Sampling Plan were met by the method blanks, however, the MDLs achieved by the laboratory for the soils and sediments are slightly higher than the required MDLs due to moisture content.

2.2.7 Field Duplicates – Acceptable with Qualification

Three field duplicates were collected with the samples. RPD values less than or equal to 35 are considered acceptable precision for water samples and RPD values less than or equal to 45 are considered acceptable precision for soil/sediment samples. With the exception noted below, field duplicate precision is acceptable. RPD values are listed in **Table 2**.

- For the field duplicate of sample SD-11, the RPD value of naphthalene and 2-methylnaphthalene are above criteria at 74.5 and 71.9, respectively. The naphthalene and 2-methylnaphthalene results of both samples are qualified as estimated (J) as shown below and in **Table 3**.
- For the field duplicate of sample Soil 1, the RPD value of acenaphthylene, benzo(b)fluoranthene, benzo(g,h,i)perylene, fluoranthene, and indeno(1,2,3-cd)pyrene are above criteria at 94.2, 61.7, 84.0, 94.8, and 82.3, respectively. The acenaphthylene, benzo(b)fluoranthene, benzo(g,h,i)perylene, fluoranthene, and indeno(1,2,3-cd)pyrene results of both samples are qualified as estimated (J) as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-11	Naphthalene	J	Field duplicate RPD > 45
SD-11	2-methylnaphthalene	J	Field duplicate RPD > 45
SD-12	Naphthalene	J	Field duplicate RPD > 45
SD-12	2-methylnaphthalene	J	Field duplicate RPD > 45
Soil 1	Acenaphthylene	J	Field duplicate RPD > 45
Soil 1	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 1	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 1	Fluoranthene	J	Field duplicate RPD > 45
Soil 1	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45
Soil 6	Acenaphthylene	J	Field duplicate RPD > 45
Soil 6	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 6	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 6	Fluoranthene	J	Field duplicate RPD > 45
Soil 6	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45

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2.2.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable. The data qualifier flags modify the usefulness of the individual values.

2.3 Total Metals and Hardness Analyses

2.3.1 Holding Times – Acceptable

The samples were analyzed within the method-required holding time of 180 days for all matrices.

2.3.2 Blank Analyses – Acceptable with Qualification

2.3.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per digestion batch. With the exceptions discussed below, target constituents were not detected in the method blanks.

- Total chromium and copper were detected in the soil method blank at 0.10 mg/kg each. Functional Guidelines prescribes three qualifications schemes when results are reported to the MDL: (1) associated sample concentrations greater than the action level (five times the blank concentration) are not qualified, (2) associated sample concentrations less than the action level and greater than the reporting limit (RL) are qualified as undetected (U) at the reported value, and (3) associated sample concentrations less than the action level and less than the reporting limit are qualified as undetected (U) at the reporting limit. Only one sample required qualification as shown below and in **Table 3**.

- Total calcium was detected in the water method blank at 0.03 mg/L. Per Functional Guidelines protocols, one sample required qualification as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-7	Total copper	U at RL	Result < RL & < 5 times the method bank level
SD-EB	Total calcium	U	Result > RL & < 5 times the method bank level

2.3.2.2 Equipment Blanks

Two equipment rinse blanks were collected with the samples; one for the soils and one for the sediments. Target metals were not detected above the MDLs, except as noted below.

- Soil equipment blank, sample Soil EB, had detection of total chromium at 0.2 µg/L and total calcium, magnesium, and hardness at 5.34, 2.85, and 25.1 mg/L, respectively. The soil sample results of these metals are greater than five times the amount in the equipment blank, therefore, no qualification is required.

- Sediment equipment blank, sample SD-EB, had detections of total chromium at 3.7 µg/L and total magnesium at 0.02 mg/L. Per Functional Guidelines protocols, the sediment samples were qualified as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-11	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-12	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-4	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-2	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-1	Total chromium	U	Result > RL & < 5 times the equipment blank level

2.3.3 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per digestion batch. The recovery values are within the laboratory control limits.

2.3.4 Matrix Spiked Sample Analyses – Acceptable with Qualification

Samples SW-1 and SD-5 were analyzed as the MS/MSDs for metals. The recovery values are within the laboratory control limits for SW-1 MS/MSD.

- The total chromium MS recovery values in the spiked analysis of sample SD-5 is above the laboratory limits of 75 to 125 percent at 157 percent. Data qualifiers are not required because the MS recovery value is acceptable at 123 percent.

- The total copper recovery values in the spiked analysis of sample SD-5 are above the laboratory limits of 75 to 125 percent at 130 and 157 percent. The total copper result of sample SD-5 is qualified as estimated (J) due to the possible high bias.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-5	Total copper	J	MS & MSD recovery above laboratory limits

2.3.5 Laboratory Duplicate Sample Analysis – Acceptable

The laboratory analyzed MS/MSDs to satisfy the precision requirement of the methods. The RPD values are within the laboratory control limits.

2.3.6 Laboratory Reporting Limits – Acceptable with Discussion

Target constituents and detection limits are listed in Table 6 of the Field Sampling Plan. The project specific metals and hardness were reported. Note that the calcium and magnesium reported for the water samples were used in the calculation of hardness. The laboratory MDLs are equal to or lower than the target MDLs listed in the Field Sampling plan, except as noted below.

- The total arsenic and copper MDLs in water and total copper and chromium MDLs in soil/sediment are greater than the target MDLs listed in Table 6 of the Field Sampling Plan.

Analyte	Target MDL	Laboratory MDL	Units
Total arsenic	0.416	0.50	µg/L
Total copper	0.222	0.30	µg/L
Total copper	0.0191	0.02	mg/kg
Total chromium	0.019	0.02	mg/kg

2.3.7 Field Duplicates – Acceptable with Qualification

Three field duplicates were collected with the samples. RPD values less than or equal to 35 for water samples and 45 for soil/sediment samples are considered acceptable precision. As Shown in **Table 2**, field duplicates precision is acceptable, with the exceptions notes below.

- For the field duplicate of samples SW-2, the RPD values of total arsenic, chromium, copper, calcium, magnesium, and hardness are above criteria at 42.1, 56.6, 57.5, 35.5, 37.8, and 36.3, respectively. The affected results are qualified as estimated (J) for sample SW-2 and SW-6.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SW-2	Arsenic	J	Field duplicate RPD > 35
SW-2	Chromium	J	Field duplicate RPD > 35
SW-2	Copper	J	Field duplicate RPD > 35
SW-2	Calcium	J	Field duplicate RPD > 35
SW-2	Magnesium	J	Field duplicate RPD > 35
SW-2	Hardness	J	Field duplicate RPD > 35
SW-6	Arsenic	J	Field duplicate RPD > 35
SW-6	Chromium	J	Field duplicate RPD > 35
SW-6	Copper	J	Field duplicate RPD > 35
SW-6	Calcium	J	Field duplicate RPD > 35

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SW-6	Magnesium	J	Field duplicate RPD > 35
SW-6	Hardness	J	Field duplicate RPD > 35

2.3.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable. The data qualifier flags modify the usefulness of the individual values.

2.4 Total Organic Carbon (TOC) and Total Solids Analyses

2.4.1 Holding Times – Acceptable

The sediment samples were analyzed within the method holding times of 28 days for TOC and seven days for total solids. The water samples were analyzed within the method holding time of 28 days for TOC.

2.4.2 Blank Analyses – Acceptable with Qualification

2.4.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per batch for TOC. Method blanks are not required for total solids since it is not a trace level analysis. TOC was detected in the water method blank as discussed below.

- TOC was detected in the water method blank at 0.2 mg/L. Functional Guidelines prescribes three qualifications schemes when results are reported to the MDL: (1) associated sample concentrations greater than the action level (five times the blank concentration) are not qualified, (2) associated sample concentrations less than the action level and greater than the reporting limit are qualified as undetected (U) at the reported value, and (3) associated sample concentrations less than the action level and less than the reporting limit are qualified as undetected (U) at the reporting limit. Only one sample required qualification as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-EB	Total organic carbon (TOC)	U at RL	Result < RL & < 5 times the method bank level

2.4.2.2 Equipment Blanks

Two equipment rinse blanks were collected with the samples. Except as discussed below, TOC was not reported in the equipment blanks.

- TOC was detected in soil equipment blank, sample Soil EB, at 1.3 mg/L. The TOC soil sample results are greater than five times the amount in the equipment blank, therefore, no qualification is required.

2.4.3 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per batch for each matrix. The recovery values are within the laboratory control limits.

2.4.4 Matrix Spike Analyses – Acceptable with Discussion

Matrix spikes were not reported for TOC. Matrix spikes are not required for total solids.

- Per ALS, they do not report matrix spikes for TOC, only laboratory duplicates. Data qualifiers are not required dud to a lack of laboratory QC results.

2.4.5 Laboratory Duplicates – Acceptable with Qualification

Laboratory duplicates were analyzed at the required frequency of one per batch for TOC and total solids. With one exception, the RPD values are below the laboratory control limits.

- The TOC RPD value for the laboratory duplicate analysis of sample Soil 2 is above the laboratory control limit of less than 20 percent at 37 percent. The TOC result of sample Soil 2 is qualified as estimated (J) due to imprecision.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 2	Total organic carbon (TOC)	J	Laboratory duplicate RPD >20

2.4.6 Laboratory Reporting Limits – Acceptable

The project reporting limit of 20 mg/kg for soil and sediment was met by the laboratory. No project detection limits were required for water.

2.4.7 Field Duplicate Precision – Acceptable with Qualification

Three field duplicates were collected with the samples. RPD values less than or equal to 35 for water samples and 45 for soil/sediment samples are considered acceptable precision. As Shown in **Table 2**, field duplicates precision is acceptable, with one exception.

- Field duplicate precision of TOC for field duplicate pair Soil 1/Soil 6 is greater than the acceptable limit of 45 percent for soil samples at 54 percent. The TOC results of both samples are qualified to indicate an estimated (J) value as noted below.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 1	Total organic carbon (TOC)	J	Field duplicate RPD >45

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 6	Total organic carbon (TOC)	J	Field duplicate RPD >45

2.4.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable. The data qualifier flags modify the usefulness of the individual values.

3.0 Data Qualifier Definitions

3.1 Organic Data Qualifiers

The following data validation qualifiers were used in the review of this data set. These qualifiers are from the *Contract Laboratory Program National Functional Guidelines for Organic Data Review*.

U The analyte was analyzed for but not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

R The sample results are rejected due to serious deficiencies in the ability to analyze the samples and meet quality control criteria. The presence or absence of the analyte cannot be verified.

3.2 Inorganic Data Qualifiers

The following data validation qualifiers were used in the review of this data set. These qualifiers are from the *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J The associated value is an estimated quantity.

UJ The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

R The data are unusable. (Note: Analyte may or may not be present.)

4.0 References

APHA. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. American Public Health Association.

ECC. 2015. Supplemental CMS Field Sampling Plan, SWMU37 Drainage Ditches & AOC B Church House Branch, International Paper, Former Wood Treating Units, Wiggins, MS. EarthCon Consultants, Inc., Sommer4ville, MA, May 21, 2015.

USEPA. 1994. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. United States Environmental Protection Agency. Office of Solid Waste and Emergence Response. February 1994.

USEPA. 1996. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Third Edition, Updates I, II, IIA, IIB, and III. United States Environmental Protection Agency. Office of Solid Waste. December 1996.

USEPA. 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency Office of Emergency and Remedial Response. EPA540/R-99/008. October 1999.

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Table 1 – Sample Data Reviewed

Sample ID	Matrix	Laboratory ID	Collected	PAHs & PCP[a]	Total Metals[b]	TOC[c]	Total Hardness[d]
SW-1	Water	J1504770-001	6/8/2015	X	X		X
SW-2	Water	J1504770-002	6/8/2015	X	X		X
SW-3	Water	J1504770-003	6/8/2015	X	X		X
SW-4	Water	J1504770-004	6/8/2015	X	X		X
SW-5	Water	J1504770-005	6/8/2015	X	X		X
SW-6	Water	J1504770-006	6/8/2015	X	X		X
SD-10	Sediment	J1504770-007	6/9/2015	X	X	X	
SD-9	Sediment	J1504770-008	6/9/2015	X	X	X	
SD-8	Sediment	J1504770-009	6/9/2015	X	X	X	
SD-7	Sediment	J1504770-010	6/9/2015	X	X	X	
Soil 5	Soil	J1504770-011	6/9/2015	X	X	X	
Soil 4	Soil	J1504770-012	6/9/2015	X	X	X	
Soil EB	Water	J1504770-013	6/9/2015		X	X	
Soil 2	Soil	J1504770-014	6/9/2015	X	X	X	
Soil 3	Soil	J1504770-015	6/9/2015	X	X	X	
Soil 1	Soil	J1504770-016	6/9/2015	X	X	X	
Soil 6	Soil	J1504770-017	6/9/2015	X	X	X	
SD-11	Sediment	J1504770-018	6/9/2015	X	X	X	
SD-12	Sediment	J1504770-019	6/9/2015	X	X	X	
SD-EB	Water	J1504770-020	6/9/2015		X	X	
SD-6	Sediment	J1504770-021	6/9/2015	X	X	X	
SD-5	Sediment	J1504770-022	6/9/2015	X	X	X	
SD-4	Sediment	J1504770-023	6/9/2015	X	X	X	
SD-3	Sediment	J1504770-024	6/9/2015	X	X	X	
SD-2	Sediment	J1504770-025	6/9/2015	X	X	X	
SD-1	Sediment	J1504770-026	6/9/2015	X	X	X	

[a] Polycyclic Aromatic Hydrocarbons (PAHs) and pentachlorophenol (PCP) by Method 8270C selective ion monitoring (SIM) (USEPA 1996)
[b] Total arsenic, chromium, and copper by Method 6020 in water and 6010B in soil/sediment, and total calcium and magnesium in water by Method 6010B (USEPA 1996)
[c] Total Organic Carbon (TOC) by Method 9060 (USEPA 1996)
[d] Total hardness by Standard Methods 2340B (APHA 1998)

Table 2 – Field Duplicate Precision

Analyte	Units	SD-11 Result	SD-12 Result	RPD[a]
Solids, Total	%	49	48	2.1
Arsenic, Total Recoverable	mg/Kg	3.52	3.36	4.6
1-Methylnaphthalene	ug/Kg	7.93	<5.97[b]	NC[c]
2-Methylnaphthalene	ug/Kg	13.5	6.36	**71.9**
Acenaphthene	ug/Kg	33.5	33.2	0.9
Acenaphthylene	ug/Kg	5.85	5.31	9.7
Anthracene	ug/Kg	21.1	21.7	2.8
Chrysene	ug/Kg	4.36	4.65	6.4
Dibenz(a,h)anthracene	ug/Kg	<5.90[b]	8.23	NC[c]
Fluoranthene	ug/Kg	63	68.2	7.9
Fluorene	ug/Kg	22	21.3	3.2
Indeno(1,2,3-cd)pyrene	ug/Kg	<4.81[b]	8.3	NC[c]
Naphthalene	ug/Kg	24.5	11.2	**74.5**
Pentachlorophenol (PCP)	ug/Kg	256	258	0.8
Phenanthrene	ug/Kg	33	28.7	13.9
Pyrene	ug/Kg	41.1	43.4	5.4
Carbon, Total Organic (TOC)	mg/Kg	51500	63000	20.1

Analyte	Units	Soil 1 Result	Soil 6 Result	RPD
Solids, Total	%	82	80	2.5
Arsenic, Total Recoverable	mg/Kg	16.3	11.4	35.4
Chromium, Total Recoverable	mg/Kg	9.5	7.26	26.7
Copper, Total Recoverable	mg/Kg	36.1	24.8	37.1
Acenaphthylene	ug/Kg	9.81	3.53	**94.2**
Anthracene	ug/Kg	27.1	<2.14[b]	NC[c]
Benzo(a)pyrene	ug/Kg	20.6	15.1	30.8
Benzo(b)fluoranthene	ug/Kg	47.5	25.1	**61.7**
Benzo(g,h,i)perylene	ug/Kg	11.6	4.74	**83.9**
Benzo(k)fluoranthene	ug/Kg	19.5	13.9	33.5
Chrysene	ug/Kg	11	<2.54[b]	NC
Fluoranthene	ug/Kg	16.9	6.03	**94.8**
Fluorene	ug/Kg	3.15	<2.93	NC[c]
Indeno(1,2,3-cd)pyrene	ug/Kg	12.6	5.22	**82.8**
Pentachlorophenol (PCP)	ug/Kg	1150	1010	12.9
Pyrene	ug/Kg	45.8	30.2	41.1
Carbon, Total Organic (TOC)	mg/Kg	1920	1100	**54.3**

Analyte	Units	SW-2 Result	SW-6 Result	RPD
Arsenic, Total Recoverable	ug/L	49.2	32.1	**42.1**
Chromium, Total Recoverable	ug/L	114	63.7	**56.6**
Copper, Total Recoverable	ug/L	83.5	46.2	**57.5**
Calcium, Total Recoverable	mg/L	7.83	5.47	**35.5**
Magnesium, Total Recoverable	mg/L	2.61	1.78	**37.8**
Anthracene	ug/L	<0.0409[b]	0.0445	NC[c]
Pentachlorophenol (PCP)	ug/L	1.4	1.42	1.4
Hardness, Total as CaCO3	mg/L	30.3	21	**36.3**

[a] Relative percent difference
[b] Not detected above the listed reporting limit
[c] Not calculatable
Bold values exceed project criteria

Table 3 – Summary of Qualified Data

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 2	Fluoranthene	J	MS/MSD RPD above laboratory limits
Soil 2	Pyrene	J	MS/MSD RPD above laboratory limits
SD-11	Naphthalene	J	Field duplicate RPD > 45
SD-11	2-methylnaphthalene	J	Field duplicate RPD > 45
SD-12	Naphthalene	J	Field duplicate RPD > 45
SD-12	2-methylnaphthalene	J	Field duplicate RPD > 45
Soil 1	Acenaphthylene	J	Field duplicate RPD > 45
Soil 1	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 1	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 1	Fluoranthene	J	Field duplicate RPD > 45
Soil 1	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45
Soil 6	Acenaphthylene	J	Field duplicate RPD > 45
Soil 6	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 6	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 6	Fluoranthene	J	Field duplicate RPD > 45
Soil 6	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45
SD-7	Total copper	U at RL	Result < RL & < 5 times the method bank level
SD-EB	Total calcium	U	Result > RL & < 5 times the method bank level
SD-11	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-12	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-4	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-2	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-1	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-5	Total copper	J	MS & MSD recovery above laboratory limits
SW-2	Arsenic	J	Field duplicate RPD > 35
SW-2	Chromium	J	Field duplicate RPD > 35
SW-2	Copper	J	Field duplicate RPD > 35
SW-2	Calcium	J	Field duplicate RPD > 35
SW-2	Magnesium	J	Field duplicate RPD > 35
SW-2	Hardness	J	Field duplicate RPD > 35
SW-6	Arsenic	J	Field duplicate RPD > 35
SW-6	Chromium	J	Field duplicate RPD > 35
SW-6	Copper	J	Field duplicate RPD > 35
SW-6	Calcium	J	Field duplicate RPD > 35
SW-6	Magnesium	J	Field duplicate RPD > 35
SW-6	Hardness	J	Field duplicate RPD > 35
SD-EB	Total organic carbon (TOC)	U at RL	Result < RL & < 5 times the method bank level
Soil 2	Total organic carbon (TOC)	J	Laboratory duplicate RPD >20
Soil 1	Total organic carbon (TOC)	J	Field duplicate RPD >45
Soil 6	Total organic carbon (TOC)	J	Field duplicate RPD >45

RL – Reporting limit

ALS Environmental

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

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SR#

CAS Contract

Project Name: IP Wiggins Church House Branch cms 02.20020008.15	Project Number
Project Manager: Doug Seely	Email Address: dseely@earthcon.com
Company/Address: EarthCon Consultants, Inc 411 A. Highland Ave #377 Somerville, MA 02144	
Phone #: 781-363-3219	FAX #: 866-263-0098
Sampler's Signature: Laura D Sanchez	Sampler's Printed Name: Laura D. Sanchez

ANALYSIS REQUESTED *(Include Method Number and Container Preservative)*

CLIENT SAMPLE ID	LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NUMBER OF CONTAINERS	PCP - EPA 8270	PAHs - EPA 8270Sim	Metals - EPA 6000	TOC - 9060	Grain Size ASTM422											REMARKS/ ALTERNATE DESCRIPTION
PRESERVATIVE						0	0	0	0	0											
Soil 5		6/9/15	1340	S	2	X	X	X	X	X											
Soil 4			1430	S	1	X	X	X	X												
Soil EB			1545	W	3	X	X	X	X												
Soil 2			1630	S	1	X	X	X	X												
Soil MS			1635	S	1	X	X	X	X												
Soil MSD			1635	S	1	X	X	X	X												
Soil 3			1645	S	1	X	X	X	X												
Soil 1			1720	S	2	X	X	X	X	X											
Soil 6			1725	S	1	X	X	X	X												
SD-11			950	SD	2	X	X	X	X	X											
SD-12			1000	SD	1	X	X	X	X												

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other _____

SPECIAL INSTRUCTIONS/COMMENTS

EB - completed w/ distilled water

See QAPP ☐

TURNAROUND REQUIREMENTS

____ RUSH (SURCHARGES APPLY)

X STANDARD

REQUESTED FAX DATE

REQUESTED REPORT DATE

REPORT REQUIREMENTS

____ I. Results Only

____ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)

____ III. Results + QC and Calibration Summaries

____ IV. Data Validation Report with Raw Data

____ V. Specialized Forms / Custom Report

Edata ____Yes ____No

INVOICE INFORMATION

PO # EarthCon Consultants

BILL TO: 1880 West Oak Pkwy
Bldg 100 Ste 106
Marietta, GA 30062
Attn: Accts Payable

SAMPLE RECEIPT: CONDITION/COOLER TEMP: CUSTODY SEALS: Y N

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
Signature: Laura D Sanchez	Signature	Signature	Signature	Signature	Signature
Printed Name: EarthCon	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm	Firm	Firm	Firm	Firm	Firm
Date/Time: 6/10/15 1200	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

Distribution: White - Return to Originator; Yellow - Retained by Client

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SR#

CAS Contract

Project Name: IP Wiggins Church House Branch CMS	Project Number: 02.20020008.15
Project Manager: Doug Seely	Email Address: dseely@earthcon.com
Company/Address: EarthCon Consultants, Inc 911 A. Highland Ave #377 Somerville, MA 02144	
Phone #: 781-363-3219	FAX #: 866-263-0098
Sampler's Signature: Laura D Sanchez	Sampler's Printed Name: Laura D. Sanchez

ANALYSIS REQUESTED *(Include Method Number and Container Preservative)*

CLIENT SAMPLE ID	LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NUMBER OF CONTAINERS	PCP EPA 8270	PAHs - 8270 SIM	Metals - EPA 6000	TOC - 9060	Grain Size ASTM 422	REMARKS/ ALTERNATE DESCRIPTION
PRESERVATIVE						0	0	0	0	0	
SD-EB		6/9/15	1120	W	3	X	X	X	X		
SD-6			1335	SD	2	X	X	X	X	X	
SD-5			1355		1	X	X	X	X		
SD-MS			1400		1	X	X	X	X		
SD-MSD			1400		1	X	X	X	X		
SD-4			1415		1	X	X	X	X		
SD-3			1735		1	X	X	X	X		
SD-2			1745		1	X	X	X	X		
SD-1			1755		1	X	X	X	X		

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other _____

SPECIAL I NSTRUCTIONS/COMMENTS

EB - completed w/distilled water

See QAPP ☐

TURNAROUND REQUIREMENTS
___ RUSH (SURCHARGES APPLY)
X STANDARD
REQUESTED FAX DATE
REQUESTED REPORT DATE

REPORT REQUIREMENTS
___ I. Results Only
___ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
___ III. Results + QC and Calibration Summaries
___ IV. Data Validation Report with Raw Data
___ V. Specialized Forms / Custom Report
Edata ___Yes ___No

INVOICE INFORMATION
PO # EarthCon Consultants
BILL TO: 1880 West Oak Pkwy
Bldg 100 Ste 106
Marietta, GA 30062
Attn: Accts. Payable

SAMPLE RECEIPT: CONDITION/COOLER TEMP: CUSTODY SEALS: Y N

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
Signature: Laura D Sanchez	Signature	Signature	Signature	Signature	Signature
Printed Name: Laura D. Sanchez	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: EarthCon	Firm	Firm	Firm	Firm	Firm
Date/Time: 6/10/15 1200	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

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Appendix D
Data Validation Memo

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MEMORANDUM

DATE: July 10, 2015
TO: Doug Seely, EarthCon Consultants
FROM: Kathy J. Gunderson, Senior Scientist
SUBJECT: Data Quality Review
PROJECT: IP, Supplemental CMDS, Closed Former Wood Treatment Facility, Wiggins, Mississippi
RE: Surface Water, Soil, and Sediment Samples Collected June 2015
PROJECT #: 02.20020008.15

1.0 Introduction

This memorandum presents the data quality review of the analytical results of eleven sediment samples, five soil samples, five surface water samples, three field duplicates, and two equipment blanks collected June 8 and 9, 2015 as part of the Corrective Measures Study at the Closed Former Wood Treatment faculty in Wiggins, Mississippi. The samples were analyzed for polycyclic aromatic hydrocarbons (PAHS), pentachlorophenol (PCP), total metals, and total organic carbon (TOC) by the methods listed in **Table 1**. The samples were analyzed by ALS Environmental (ALS) of Jacksonville, Florida.

The quality assurance criteria used to assess the data are from the Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA 1994), the Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 1999), the analytical methods, or the professional judgment of the validation chemist. The target detection limits are from the Supplemental CMS Field Sampling Plan (EDD 2015). The following laboratory deliverables were evaluated during the review process:

- Chain-of-custody (COC) documentation to assess holding times and verify report completeness

- Laboratory quality control (QC) sample results, including method blanks, surrogate spikes, laboratory control samples (LCSs), matrix spike/matrix spike duplicates (MS/MSDs), and laboratory duplicates

- Field QC samples to assess equipment and trip blank contamination and field duplicate precision

Field duplicate precision is presented in **Table 2** and the qualified data are summarized in **Table 3**. Tables are located at the end of this memorandum. Data qualifier flags have been added the hardcopy laboratory reports used for validation and the project data tables.

2.0 Data Validation Findings

2.1 Custody, Preservation, and Completeness – Acceptable with Discussion

Sample custody was maintained as required from sample collection to receipt at the laboratory. The samples were received intact and were properly preserved. The report is complete and, with two exceptions, contains results for all samples and tests requested on the COC forms.

- Equipment rinse blank samples SD-EB and Soil EB were not analyzed for PAH or PCP. Due to an oversight, sample containers were not provided by the laboratory for these analyses.

2.2 Polycyclic Aromatic Hydrocarbons and Pentachlorophenol Analyses

2.2.1 Holding Times – Acceptable

The samples were extracted within the method-specified holding times of 14 days from collection for soil/sediment samples and seven days from collection for water samples. The sample extracts were analyzed within the method-specific holding time of 40 days from extraction.

2.2.2 Blank Analyses – Acceptable

2.2.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per extraction batch. Target analytes were not detected in the method blanks above the method detection limits (MDLs).

2.2.2.2 Equipment Blanks

Equipment rinse blank were not collected for PAHs or PCP.

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2.2.3 Surrogate Analyses – Acceptable with Discussion

Surrogate compounds were added to all samples, blanks and QC samples as required. The recovery values are within the laboratory control limits with one exception.

- The p-terphenyl-d_{14} recovery in sample Soil 5 is below than the laboratory limits of 41 to 146 percent at 36 percent. Following Functional Guidelines protocols, data qualifiers are not required when only one of three surrogate recovery values is outside criteria.

2.2.4 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per extraction batch. The recovery values are within the laboratory control limits.

2.2.5 Matrix Spike/Matrix Spike Duplicate Analyses – Acceptable with Qualification

MS/MSD analyses were performed at the required frequency of one pair per extraction batch. With the exceptions noted below, the recovery and relative percent difference (RPD) values are within the laboratory control limits.

- For the MS/MSD analysis of sample Soil 2, the MSD and RPD values of fluoranthene and pyrene are outside the laboratory control limits. Data qualifiers are not required for the high MSD recovery because, in both cases, the MS recovery values are acceptable. The fluoranthene and pyrene results of sample Soil 2 are qualified as estimated (J) due to the imprecision of the MS/MSD.

- The PCP MS and MSD recovery values in the spiked analyses of sample Soil 2 are above the laboratory control limits of 10 to 100 percent at 113 and 208 percent. Data quality is not affected because the native sample concentration overwhelms the amount spiked by a factor of 12. Data qualifiers are not required.

- The PCP MS and MSD recovery values in the spiked analyses of sample SD-5 are below the laboratory control limits of 10 to 100 percent at 20 and 43 percent. Data quality is not affected because the native sample concentration overwhelms the amount spiked by a factor of six. Data qualifiers are not required.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 2	Fluoranthene	J	MS/MSD RPD above laboratory limits
Soil 2	Pyrene	J	MS/MSD RPD above laboratory limits

2.2.6 Laboratory Reporting Limits – Acceptable with Discussion

Target constituents and detection limits are listed in Table 6 of the Field Sampling Plan. PCP and the correct list of PAHs were reported. With one exception, the water MDLs are below the Region 4 Surface Water Screening Values for chronic exposure. The soil and sediment MDLs are below the Region 4 Ecological Technical Advisory Group Soil Screening Values.

- The MDLs listed in Table 6 of the Field Sampling Plan were met by the method blanks, however, the MDLs achieved by the laboratory for the soils and sediments are slightly higher than the required MDLs due to moisture content.

2.2.7 Field Duplicates – Acceptable with Qualification

Three field duplicates were collected with the samples. RPD values less than or equal to 35 are considered acceptable precision for water samples and RPD values less than or equal to 45 are considered acceptable precision for soil/sediment samples. With the exception noted below, field duplicate precision is acceptable. RPD values are listed in **Table 2**.

- For the field duplicate of sample SD-11, the RPD value of naphthalene and 2-methylnaphthalene are above criteria at 74.5 and 71.9, respectively. The naphthalene and 2-methylnaphthalene results of both samples are qualified as estimated (J) as shown below and in **Table 3**.
- For the field duplicate of sample Soil 1, the RPD value of acenaphthylene, benzo(b)fluoranthene, benzo(g,h,i)perylene, fluoranthene, and indeno(1,2,3-cd)pyrene are above criteria at 94.2, 61.7, 84.0, 94.8, and 82.3, respectively. The acenaphthylene, benzo(b)fluoranthene, benzo(g,h,i)perylene, fluoranthene, and indeno(1,2,3-cd)pyrene results of both samples are qualified as estimated (J) as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-11	Naphthalene	J	Field duplicate RPD > 45
SD-11	2-methylnaphthalene	J	Field duplicate RPD > 45
SD-12	Naphthalene	J	Field duplicate RPD > 45
SD-12	2-methylnaphthalene	J	Field duplicate RPD > 45
Soil 1	Acenaphthylene	J	Field duplicate RPD > 45
Soil 1	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 1	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 1	Fluoranthene	J	Field duplicate RPD > 45
Soil 1	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45
Soil 6	Acenaphthylene	J	Field duplicate RPD > 45
Soil 6	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 6	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 6	Fluoranthene	J	Field duplicate RPD > 45
Soil 6	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45

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2.2.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable. The data qualifier flags modify the usefulness of the individual values.

2.3 Total Metals and Hardness Analyses

2.3.1 Holding Times – Acceptable

The samples were analyzed within the method-required holding time of 180 days for all matrices.

2.3.2 Blank Analyses – Acceptable with Qualification

2.3.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per digestion batch. With the exceptions discussed below, target constituents were not detected in the method blanks.

- Total chromium and copper were detected in the soil method blank at 0.10 mg/kg each. Functional Guidelines prescribes three qualifications schemes when results are reported to the MDL: (1) associated sample concentrations greater than the action level (five times the blank concentration) are not qualified, (2) associated sample concentrations less than the action level and greater than the reporting limit (RL) are qualified as undetected (U) at the reported value, and (3) associated sample concentrations less than the action level and less than the reporting limit are qualified as undetected (U) at the reporting limit. Only one sample required qualification as shown below and in **Table 3**.

- Total calcium was detected in the water method blank at 0.03 mg/L. Per Functional Guidelines protocols, one sample required qualification as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-7	Total copper	U at RL	Result < RL & < 5 times the method bank level
SD-EB	Total calcium	U	Result > RL & < 5 times the method bank level

2.3.2.2 Equipment Blanks

Two equipment rinse blanks were collected with the samples; one for the soils and one for the sediments. Target metals were not detected above the MDLs, except as noted below.

- Soil equipment blank, sample Soil EB, had detection of total chromium at 0.2 µg/L and total calcium, magnesium, and hardness at 5.34, 2.85, and 25.1 mg/L, respectively. The soil sample results of these metals are greater than five times the amount in the equipment blank, therefore, no qualification is required.

- Sediment equipment blank, sample SD-EB, had detections of total chromium at 3.7 µg/L and total magnesium at 0.02 mg/L. Per Functional Guidelines protocols, the sediment samples were qualified as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-11	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-12	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-4	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-2	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-1	Total chromium	U	Result > RL & < 5 times the equipment blank level

2.3.3 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per digestion batch. The recovery values are within the laboratory control limits.

2.3.4 Matrix Spiked Sample Analyses – Acceptable with Qualification

Samples SW-1 and SD-5 were analyzed as the MS/MSDs for metals. The recovery values are within the laboratory control limits for SW-1 MS/MSD.

- The total chromium MS recovery values in the spiked analysis of sample SD-5 is above the laboratory limits of 75 to 125 percent at 157 percent. Data qualifiers are not required because the MS recovery value is acceptable at 123 percent.

- The total copper recovery values in the spiked analysis of sample SD-5 are above the laboratory limits of 75 to 125 percent at 130 and 157 percent. The total copper result of sample SD-5 is qualified as estimated (J) due to the possible high bias.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-5	Total copper	J	MS & MSD recovery above laboratory limits

2.3.5 Laboratory Duplicate Sample Analysis – Acceptable

The laboratory analyzed MS/MSDs to satisfy the precision requirement of the methods. The RPD values are within the laboratory control limits.

2.3.6 Laboratory Reporting Limits – Acceptable with Discussion

Target constituents and detection limits are listed in Table 6 of the Field Sampling Plan. The project specific metals and hardness were reported. Note that the calcium and magnesium reported for the water samples were used in the calculation of hardness. The laboratory MDLs are equal to or lower than the target MDLs listed in the Field Sampling plan, except as noted below.

- The total arsenic and copper MDLs in water and total copper and chromium MDLs in soil/sediment are greater than the target MDLs listed in Table 6 of the Field Sampling Plan.

Analyte	Target MDL	Laboratory MDL	Units
Total arsenic	0.416	0.50	µg/L
Total copper	0.222	0.30	µg/L
Total copper	0.0191	0.02	mg/kg
Total chromium	0.019	0.02	mg/kg

2.3.7 Field Duplicates – Acceptable with Qualification

Three field duplicates were collected with the samples. RPD values less than or equal to 35 for water samples and 45 for soil/sediment samples are considered acceptable precision. As Shown in **Table 2**, field duplicates precision is acceptable, with the exceptions notes below.

- For the field duplicate of samples SW-2, the RPD values of total arsenic, chromium, copper, calcium, magnesium, and hardness are above criteria at 42.1, 56.6, 57.5, 35.5, 37.8, and 36.3, respectively. The affected results are qualified as estimated (J) for sample SW-2 and SW-6.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SW-2	Arsenic	J	Field duplicate RPD > 35
SW-2	Chromium	J	Field duplicate RPD > 35
SW-2	Copper	J	Field duplicate RPD > 35
SW-2	Calcium	J	Field duplicate RPD > 35
SW-2	Magnesium	J	Field duplicate RPD > 35
SW-2	Hardness	J	Field duplicate RPD > 35
SW-6	Arsenic	J	Field duplicate RPD > 35
SW-6	Chromium	J	Field duplicate RPD > 35
SW-6	Copper	J	Field duplicate RPD > 35
SW-6	Calcium	J	Field duplicate RPD > 35

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SW-6	Magnesium	J	Field duplicate RPD > 35
SW-6	Hardness	J	Field duplicate RPD > 35

2.3.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable. The data qualifier flags modify the usefulness of the individual values.

2.4 Total Organic Carbon (TOC) and Total Solids Analyses

2.4.1 Holding Times – Acceptable

The sediment samples were analyzed within the method holding times of 28 days for TOC and seven days for total solids. The water samples were analyzed within the method holding time of 28 days for TOC.

2.4.2 Blank Analyses – Acceptable with Qualification

2.4.2.1 Method Blanks

Method blanks were analyzed at the required frequency of one per batch for TOC. Method blanks are not required for total solids since it is not a trace level analysis. TOC was detected in the water method blank as discussed below.

- TOC was detected in the water method blank at 0.2 mg/L. Functional Guidelines prescribes three qualifications schemes when results are reported to the MDL: (1) associated sample concentrations greater than the action level (five times the blank concentration) are not qualified, (2) associated sample concentrations less than the action level and greater than the reporting limit are qualified as undetected (U) at the reported value, and (3) associated sample concentrations less than the action level and less than the reporting limit are qualified as undetected (U) at the reporting limit. Only one sample required qualification as shown below and in **Table 3**.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
SD-EB	Total organic carbon (TOC)	U at RL	Result < RL & < 5 times the method bank level

2.4.2.2 Equipment Blanks

Two equipment rinse blanks were collected with the samples. Except as discussed below, TOC was not reported in the equipment blanks.

- TOC was detected in soil equipment blank, sample Soil EB, at 1.3 mg/L. The TOC soil sample results are greater than five times the amount in the equipment blank, therefore, no qualification is required.

2.4.3 Laboratory Control Sample Analyses – Acceptable

LCSs were analyzed at the required frequency of one per batch for each matrix. The recovery values are within the laboratory control limits.

2.4.4 Matrix Spike Analyses – Acceptable with Discussion

Matrix spikes were not reported for TOC. Matrix spikes are not required for total solids.

- Per ALS, they do not report matrix spikes for TOC, only laboratory duplicates. Data qualifiers are not required dud to a lack of laboratory QC results.

2.4.5 Laboratory Duplicates – Acceptable with Qualification

Laboratory duplicates were analyzed at the required frequency of one per batch for TOC and total solids. With one exception, the RPD values are below the laboratory control limits.

- The TOC RPD value for the laboratory duplicate analysis of sample Soil 2 is above the laboratory control limit of less than 20 percent at 37 percent. The TOC result of sample Soil 2 is qualified as estimated (J) due to imprecision.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 2	Total organic carbon (TOC)	J	Laboratory duplicate RPD >20

2.4.6 Laboratory Reporting Limits – Acceptable

The project reporting limit of 20 mg/kg for soil and sediment was met by the laboratory. No project detection limits were required for water.

2.4.7 Field Duplicate Precision – Acceptable with Qualification

Three field duplicates were collected with the samples. RPD values less than or equal to 35 for water samples and 45 for soil/sediment samples are considered acceptable precision. As Shown in **Table 2**, field duplicates precision is acceptable, with one exception.

- Field duplicate precision of TOC for field duplicate pair Soil 1/Soil 6 is greater than the acceptable limit of 45 percent for soil samples at 54 percent. The TOC results of both samples are qualified to indicate an estimated (J) value as noted below.

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 1	Total organic carbon (TOC)	J	Field duplicate RPD >45

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 6	Total organic carbon (TOC)	J	Field duplicate RPD >45

2.4.8 Overall Assessment of Data Usability

The usability of the data is based on the EPA guidance documents noted previously. Upon consideration of the information presented here, the data are acceptable. The data qualifier flags modify the usefulness of the individual values.

3.0 Data Qualifier Definitions

3.1 Organic Data Qualifiers

The following data validation qualifiers were used in the review of this data set. These qualifiers are from the *Contract Laboratory Program National Functional Guidelines for Organic Data Review*.

U The analyte was analyzed for but not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

R The sample results are rejected due to serious deficiencies in the ability to analyze the samples and meet quality control criteria. The presence or absence of the analyte cannot be verified.

3.2 Inorganic Data Qualifiers

The following data validation qualifiers were used in the review of this data set. These qualifiers are from the *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*.

U The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J The associated value is an estimated quantity.

UJ The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

R The data are unusable. (Note: Analyte may or may not be present.)

4.0 References

APHA. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. American Public Health Association.

ECC. 2015. Supplemental CMS Field Sampling Plan, SWMU37 Drainage Ditches & AOC B Church House Branch, International Paper, Former Wood Treating Units, Wiggins, MS. EarthCon Consultants, Inc., Sommer4ville, MA, May 21, 2015.

USEPA. 1994. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. United States Environmental Protection Agency. Office of Solid Waste and Emergence Response. February 1994.

USEPA. 1996. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Third Edition, Updates I, II, IIA, IIB, and III. United States Environmental Protection Agency. Office of Solid Waste. December 1996.

USEPA. 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency Office of Emergency and Remedial Response. EPA540/R-99/008. October 1999.

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Table 1 – Sample Data Reviewed

Sample ID	Matrix	Laboratory ID	Collected	PAHs & PCP[a]	Total Metals[b]	TOC[c]	Total Hardness[d]
SW-1	Water	J1504770-001	6/8/2015	X	X		X
SW-2	Water	J1504770-002	6/8/2015	X	X		X
SW-3	Water	J1504770-003	6/8/2015	X	X		X
SW-4	Water	J1504770-004	6/8/2015	X	X		X
SW-5	Water	J1504770-005	6/8/2015	X	X		X
SW-6	Water	J1504770-006	6/8/2015	X	X		X
SD-10	Sediment	J1504770-007	6/9/2015	X	X	X	
SD-9	Sediment	J1504770-008	6/9/2015	X	X	X	
SD-8	Sediment	J1504770-009	6/9/2015	X	X	X	
SD-7	Sediment	J1504770-010	6/9/2015	X	X	X	
Soil 5	Soil	J1504770-011	6/9/2015	X	X	X	
Soil 4	Soil	J1504770-012	6/9/2015	X	X	X	
Soil EB	Water	J1504770-013	6/9/2015		X	X	
Soil 2	Soil	J1504770-014	6/9/2015	X	X	X	
Soil 3	Soil	J1504770-015	6/9/2015	X	X	X	
Soil 1	Soil	J1504770-016	6/9/2015	X	X	X	
Soil 6	Soil	J1504770-017	6/9/2015	X	X	X	
SD-11	Sediment	J1504770-018	6/9/2015	X	X	X	
SD-12	Sediment	J1504770-019	6/9/2015	X	X	X	
SD-EB	Water	J1504770-020	6/9/2015		X	X	
SD-6	Sediment	J1504770-021	6/9/2015	X	X	X	
SD-5	Sediment	J1504770-022	6/9/2015	X	X	X	
SD-4	Sediment	J1504770-023	6/9/2015	X	X	X	
SD-3	Sediment	J1504770-024	6/9/2015	X	X	X	
SD-2	Sediment	J1504770-025	6/9/2015	X	X	X	
SD-1	Sediment	J1504770-026	6/9/2015	X	X	X	

[a] Polycyclic Aromatic Hydrocarbons (PAHs) and pentachlorophenol (PCP) by Method 8270C selective ion monitoring (SIM) (USEPA 1996)
[b] Total arsenic, chromium, and copper by Method 6020 in water and 6010B in soil/sediment, and total calcium and magnesium in water by Method 6010B (USEPA 1996)
[c] Total Organic Carbon (TOC) by Method 9060 (USEPA 1996)
[d] Total hardness by Standard Methods 2340B (APHA 1998)

Table 2 – Field Duplicate Precision

Analyte	Units	SD-11 Result	SD-12 Result	RPD[a]
Solids, Total	%	49	48	2.1
Arsenic, Total Recoverable	mg/Kg	3.52	3.36	4.6
1-Methylnaphthalene	ug/Kg	7.93	<5.97[b]	NC[c]
2-Methylnaphthalene	ug/Kg	13.5	6.36	**71.9**
Acenaphthene	ug/Kg	33.5	33.2	0.9
Acenaphthylene	ug/Kg	5.85	5.31	9.7
Anthracene	ug/Kg	21.1	21.7	2.8
Chrysene	ug/Kg	4.36	4.65	6.4
Dibenz(a,h)anthracene	ug/Kg	<5.90[b]	8.23	NC[c]
Fluoranthene	ug/Kg	63	68.2	7.9
Fluorene	ug/Kg	22	21.3	3.2
Indeno(1,2,3-cd)pyrene	ug/Kg	<4.81[b]	8.3	NC[c]
Naphthalene	ug/Kg	24.5	11.2	**74.5**
Pentachlorophenol (PCP)	ug/Kg	256	258	0.8
Phenanthrene	ug/Kg	33	28.7	13.9
Pyrene	ug/Kg	41.1	43.4	5.4
Carbon, Total Organic (TOC)	mg/Kg	51500	63000	20.1

Analyte	Units	Soil 1 Result	Soil 6 Result	RPD
Solids, Total	%	82	80	2.5
Arsenic, Total Recoverable	mg/Kg	16.3	11.4	35.4
Chromium, Total Recoverable	mg/Kg	9.5	7.26	26.7
Copper, Total Recoverable	mg/Kg	36.1	24.8	37.1
Acenaphthylene	ug/Kg	9.81	3.53	**94.2**
Anthracene	ug/Kg	27.1	<2.14[b]	NC[c]
Benzo(a)pyrene	ug/Kg	20.6	15.1	30.8
Benzo(b)fluoranthene	ug/Kg	47.5	25.1	**61.7**
Benzo(g,h,i)perylene	ug/Kg	11.6	4.74	**83.9**
Benzo(k)fluoranthene	ug/Kg	19.5	13.9	33.5
Chrysene	ug/Kg	11	<2.54[b]	NC
Fluoranthene	ug/Kg	16.9	6.03	**94.8**
Fluorene	ug/Kg	3.15	<2.93	NC[c]
Indeno(1,2,3-cd)pyrene	ug/Kg	12.6	5.22	**82.8**
Pentachlorophenol (PCP)	ug/Kg	1150	1010	12.9
Pyrene	ug/Kg	45.8	30.2	41.1
Carbon, Total Organic (TOC)	mg/Kg	1920	1100	**54.3**

Analyte	Units	SW-2 Result	SW-6 Result	RPD
Arsenic, Total Recoverable	ug/L	49.2	32.1	**42.1**
Chromium, Total Recoverable	ug/L	114	63.7	**56.6**
Copper, Total Recoverable	ug/L	83.5	46.2	**57.5**
Calcium, Total Recoverable	mg/L	7.83	5.47	**35.5**
Magnesium, Total Recoverable	mg/L	2.61	1.78	**37.8**
Anthracene	ug/L	<0.0409[b]	0.0445	NC[c]
Pentachlorophenol (PCP)	ug/L	1.4	1.42	1.4
Hardness, Total as CaCO3	mg/L	30.3	21	**36.3**

[a] Relative percent difference
[b] Not detected above the listed reporting limit
[c] Not calculatable
Bold values exceed project criteria

Table 3 – Summary of Qualified Data

Sample ID	Analyte	Qualifier	Quality Control Exceedance
Soil 2	Fluoranthene	J	MS/MSD RPD above laboratory limits
Soil 2	Pyrene	J	MS/MSD RPD above laboratory limits
SD-11	Naphthalene	J	Field duplicate RPD > 45
SD-11	2-methylnaphthalene	J	Field duplicate RPD > 45
SD-12	Naphthalene	J	Field duplicate RPD > 45
SD-12	2-methylnaphthalene	J	Field duplicate RPD > 45
Soil 1	Acenaphthylene	J	Field duplicate RPD > 45
Soil 1	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 1	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 1	Fluoranthene	J	Field duplicate RPD > 45
Soil 1	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45
Soil 6	Acenaphthylene	J	Field duplicate RPD > 45
Soil 6	benzo(b)fluoranthene	J	Field duplicate RPD > 45
Soil 6	benzo(g,h,i)perylene	J	Field duplicate RPD > 45
Soil 6	Fluoranthene	J	Field duplicate RPD > 45
Soil 6	Indeno(1,2,3-cd)pyrene	J	Field duplicate RPD > 45
SD-7	Total copper	U at RL	Result < RL & < 5 times the method bank level
SD-EB	Total calcium	U	Result > RL & < 5 times the method bank level
SD-11	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-12	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-4	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-2	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-1	Total chromium	U	Result > RL & < 5 times the equipment blank level
SD-5	Total copper	J	MS & MSD recovery above laboratory limits
SW-2	Arsenic	J	Field duplicate RPD > 35
SW-2	Chromium	J	Field duplicate RPD > 35
SW-2	Copper	J	Field duplicate RPD > 35
SW-2	Calcium	J	Field duplicate RPD > 35
SW-2	Magnesium	J	Field duplicate RPD > 35
SW-2	Hardness	J	Field duplicate RPD > 35
SW-6	Arsenic	J	Field duplicate RPD > 35
SW-6	Chromium	J	Field duplicate RPD > 35
SW-6	Copper	J	Field duplicate RPD > 35
SW-6	Calcium	J	Field duplicate RPD > 35
SW-6	Magnesium	J	Field duplicate RPD > 35
SW-6	Hardness	J	Field duplicate RPD > 35
SD-EB	Total organic carbon (TOC)	U at RL	Result < RL & < 5 times the method bank level
Soil 2	Total organic carbon (TOC)	J	Laboratory duplicate RPD >20
Soil 1	Total organic carbon (TOC)	J	Field duplicate RPD >45
Soil 6	Total organic carbon (TOC)	J	Field duplicate RPD >45

RL – Reporting limit

Appendix E
Analytical Laboratory Data Sheets

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 18:05
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-1	**Units:**	ug/L
Lab Code:	J1504770-001	**Basis:**	NA

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3510C

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 11:54	6/15/15	
2-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 11:54	6/15/15	
Acenaphthene	0.0410 U	0.100	0.0410	1	06/17/15 11:54	6/15/15	
Acenaphthylene	0.0250 U	0.100	0.0250	1	06/17/15 11:54	6/15/15	
Anthracene	0.0380 U	0.100	0.0380	1	06/17/15 11:54	6/15/15	
Benz(a)anthracene	0.0350 U	0.100	0.0350	1	06/17/15 11:54	6/15/15	
Benzo(a)pyrene	0.0310 U	0.100	0.0310	1	06/17/15 11:54	6/15/15	
Benzo(b)fluoranthene	0.0250 U	0.100	0.0250	1	06/17/15 11:54	6/15/15	
Benzo(g,h,i)perylene	0.0390 U	0.100	0.0390	1	06/17/15 11:54	6/15/15	
Benzo(k)fluoranthene	0.0350 U	0.100	0.0350	1	06/17/15 11:54	6/15/15	
Chrysene	0.0240 U	0.100	0.0240	1	06/17/15 11:54	6/15/15	
Dibenz(a,h)anthracene	0.0360 U	0.100	0.0360	1	06/17/15 11:54	6/15/15	
Fluoranthene	0.0390 U	0.100	0.0390	1	06/17/15 11:54	6/15/15	
Fluorene	0.0470 U	0.100	0.0470	1	06/17/15 11:54	6/15/15	
Indeno(1,2,3-cd)pyrene	0.0400 U	0.100	0.0400	1	06/17/15 11:54	6/15/15	
Naphthalene	0.0390 U	0.100	0.0390	1	06/17/15 11:54	6/15/15	
Pentachlorophenol (PCP)	0.0390 U	1.00	0.0390	1	06/17/15 11:54	6/15/15	
Phenanthrene	0.0350 U	0.100	0.0350	1	06/17/15 11:54	6/15/15	
Pyrene	0.0310 U	0.100	0.0310	1	06/17/15 11:54	6/15/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	69	11 - 163	06/17/15 11:54	
2-Fluorobiphenyl	65	22 - 105	06/17/15 11:54	
p-Terphenyl-d14	74	25 - 127	06/17/15 11:54	

AQ 6.30.15

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 18:05
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-1	**Basis:**	NA
Lab Code:	J1504770-001		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	**1.1**	ug/L	1.0	0.5	1	06/16/15 20:17	06/16/15	
Calcium, Total Recoverable	6010B	**2.75**	mg/L	0.10	0.02	1	06/16/15 05:16	06/15/15	
Chromium, Total Recoverable	6020	**3.2**	ug/L	1.0	0.2	1	06/16/15 20:17	06/16/15	
Copper, Total Recoverable	6020	**1.4**	ug/L	1.0	0.3	1	06/16/15 20:17	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	**10.2**	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**0.81**	mg/L	0.10	0.02	1	06/16/15 05:16	06/15/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 17:40
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-2	**Units:**	ug/L
Lab Code:	J1504770-002	**Basis:**	NA

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3510C

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	0.0474 U	0.108	0.0474	1	06/17/15 13:07	6/15/15	
2-Methylnaphthalene	0.0474 U	0.108	0.0474	1	06/17/15 13:07	6/15/15	
Acenaphthene	0.0441 U	0.108	0.0441	1	06/17/15 13:07	6/15/15	
Acenaphthylene	0.0269 U	0.108	0.0269	1	06/17/15 13:07	6/15/15	
Anthracene	0.0409 U	0.108	0.0409	1	06/17/15 13:07	6/15/15	
Benz(a)anthracene	0.0377 U	0.108	0.0377	1	06/17/15 13:07	6/15/15	
Benzo(a)pyrene	0.0334 U	0.108	0.0334	1	06/17/15 13:07	6/15/15	
Benzo(b)fluoranthene	0.0269 U	0.108	0.0269	1	06/17/15 13:07	6/15/15	
Benzo(g,h,i)perylene	0.0420 U	0.108	0.0420	1	06/17/15 13:07	6/15/15	
Benzo(k)fluoranthene	0.0377 U	0.108	0.0377	1	06/17/15 13:07	6/15/15	
Chrysene	0.0259 U	0.108	0.0259	1	06/17/15 13:07	6/15/15	
Dibenz(a,h)anthracene	0.0388 U	0.108	0.0388	1	06/17/15 13:07	6/15/15	
Fluoranthene	0.0420 U	0.108	0.0420	1	06/17/15 13:07	6/15/15	
Fluorene	0.0506 U	0.108	0.0506	1	06/17/15 13:07	6/15/15	
Indeno(1,2,3-cd)pyrene	0.0431 U	0.108	0.0431	1	06/17/15 13:07	6/15/15	
Naphthalene	0.0420 U	0.108	0.0420	1	06/17/15 13:07	6/15/15	
Pentachlorophenol (PCP)	**1.40**	1.08	0.0420	1	06/17/15 13:07	6/15/15	
Phenanthrene	0.0377 U	0.108	0.0377	1	06/17/15 13:07	6/15/15	
Pyrene	0.0334 U	0.108	0.0334	1	06/17/15 13:07	6/15/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	78	11 - 163	06/17/15 13:07	
2-Fluorobiphenyl	58	22 - 105	06/17/15 13:07	
p-Terphenyl-d14	69	25 - 127	06/17/15 13:07	

6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 17:40
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-2	**Basis:**	NA
Lab Code:	J1504770-002		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	**49.2** J	ug/L	1.0	0.5	1	06/16/15 20:42	06/16/15	
Calcium, Total Recoverable	6010B	**7.83**	mg/L	0.10	0.02	1	06/16/15 05:38	06/15/15	
Chromium, Total Recoverable	6020	**114**	ug/L	1.0	0.2	1	06/16/15 20:42	06/16/15	
Copper, Total Recoverable	6020	**83.5**	ug/L	1.0	0.3	1	06/16/15 20:42	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	**30.3**	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**2.61**	mg/L	0.10	0.02	1	06/16/15 05:38	06/15/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 16:50
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-3	**Units:**	ug/L
Lab Code:	J1504770-003	**Basis:**	NA

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3510C

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 13:31	6/15/15	
2-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 13:31	6/15/15	
Acenaphthene	0.0410 U	0.100	0.0410	1	06/17/15 13:31	6/15/15	
Acenaphthylene	0.0250 U	0.100	0.0250	1	06/17/15 13:31	6/15/15	
Anthracene	**0.130**	0.100	0.0380	1	06/17/15 13:31	6/15/15	
Benz(a)anthracene	0.0350 U	0.100	0.0350	1	06/17/15 13:31	6/15/15	
Benzo(a)pyrene	0.0310 U	0.100	0.0310	1	06/17/15 13:31	6/15/15	
Benzo(b)fluoranthene	0.0250 U	0.100	0.0250	1	06/17/15 13:31	6/15/15	
Benzo(g,h,i)perylene	0.0390 U	0.100	0.0390	1	06/17/15 13:31	6/15/15	
Benzo(k)fluoranthene	0.0350 U	0.100	0.0350	1	06/17/15 13:31	6/15/15	
Chrysene	0.0240 U	0.100	0.0240	1	06/17/15 13:31	6/15/15	
Dibenz(a,h)anthracene	0.0360 U	0.100	0.0360	1	06/17/15 13:31	6/15/15	
Fluoranthene	0.0390 U	0.100	0.0390	1	06/17/15 13:31	6/15/15	
Fluorene	0.0470 U	0.100	0.0470	1	06/17/15 13:31	6/15/15	
Indeno(1,2,3-cd)pyrene	0.0400 U	0.100	0.0400	1	06/17/15 13:31	6/15/15	
Naphthalene	0.0390 U	0.100	0.0390	1	06/17/15 13:31	6/15/15	
Pentachlorophenol (PCP)	**1.27**	1.00	0.0390	1	06/17/15 13:31	6/15/15	
Phenanthrene	0.0350 U	0.100	0.0350	1	06/17/15 13:31	6/15/15	
Pyrene	0.0310 U	0.100	0.0310	1	06/17/15 13:31	6/15/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	90	11 - 163	06/17/15 13:31	
2-Fluorobiphenyl	68	22 - 105	06/17/15 13:31	
p-Terphenyl-d14	69	25 - 127	06/17/15 13:31	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 16:50
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-3	**Basis:**	NA
Lab Code:	J1504770-003		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	**43.1**	ug/L	1.0	0.5	1	06/16/15 20:47	06/16/15	
Calcium, Total Recoverable	6010B	**7.94**	mg/L	0.10	0.02	1	06/16/15 05:42	06/15/15	
Chromium, Total Recoverable	6020	**10.8**	ug/L	1.0	0.2	1	06/16/15 20:47	06/16/15	
Copper, Total Recoverable	6020	**7.2**	ug/L	1.0	0.3	1	06/16/15 20:47	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	**26.5**	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**1.61**	mg/L	0.10	0.02	1	06/16/15 05:42	06/15/15	

6.30.15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 15:30
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-4	**Units:**	ug/L
Lab Code:	J1504770-004	**Basis:**	NA

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3510C

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 13:56	6/15/15	
2-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 13:56	6/15/15	
Acenaphthene	0.0410 U	0.100	0.0410	1	06/17/15 13:56	6/15/15	
Acenaphthylene	0.0250 U	0.100	0.0250	1	06/17/15 13:56	6/15/15	
Anthracene	0.0380 U	0.100	0.0380	1	06/17/15 13:56	6/15/15	
Benz(a)anthracene	0.0350 U	0.100	0.0350	1	06/17/15 13:56	6/15/15	
Benzo(a)pyrene	0.0310 U	0.100	0.0310	1	06/17/15 13:56	6/15/15	
Benzo(b)fluoranthene	0.0250 U	0.100	0.0250	1	06/17/15 13:56	6/15/15	
Benzo(g,h,i)perylene	0.0390 U	0.100	0.0390	1	06/17/15 13:56	6/15/15	
Benzo(k)fluoranthene	0.0350 U	0.100	0.0350	1	06/17/15 13:56	6/15/15	
Chrysene	0.0240 U	0.100	0.0240	1	06/17/15 13:56	6/15/15	
Dibenz(a,h)anthracene	0.0360 U	0.100	0.0360	1	06/17/15 13:56	6/15/15	
Fluoranthene	0.0390 U	0.100	0.0390	1	06/17/15 13:56	6/15/15	
Fluorene	0.0470 U	0.100	0.0470	1	06/17/15 13:56	6/15/15	
Indeno(1,2,3-cd)pyrene	0.0400 U	0.100	0.0400	1	06/17/15 13:56	6/15/15	
Naphthalene	0.0390 U	0.100	0.0390	1	06/17/15 13:56	6/15/15	
Pentachlorophenol (PCP)	0.0390 U	1.00	0.0390	1	06/17/15 13:56	6/15/15	
Phenanthrene	0.0350 U	0.100	0.0350	1	06/17/15 13:56	6/15/15	
Pyrene	0.0310 U	0.100	0.0310	1	06/17/15 13:56	6/15/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	78	11 - 163	06/17/15 13:56	
2-Fluorobiphenyl	79	22 - 105	06/17/15 13:56	
p-Terphenyl-d14	73	25 - 127	06/17/15 13:56	

KJ 6-30-15

Analytical Report

Client: EarthCon Site Services Inc
Project: IP Wiggins Church House Branch CMS/02.20020008.15
Sample Matrix: Water

Service Request: J1504770
Date Collected: 06/08/15 15:30
Date Received: 06/11/15 10:00

Sample Name: SW-4
Lab Code: J1504770-004

Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	**2.4**	ug/L	1.0	0.5	1	06/16/15 21:02	06/16/15	
Calcium, Total Recoverable	6010B	**1.10**	mg/L	0.10	0.02	1	06/16/15 06:04	06/15/15	
Chromium, Total Recoverable	6020	**1.2**	ug/L	1.0	0.2	1	06/16/15 21:02	06/16/15	
Copper, Total Recoverable	6020	0.3 U	ug/L	1.0	0.3	1	06/16/15 21:02	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	**3.8**	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**0.26**	mg/L	0.10	0.02	1	06/16/15 06:04	06/15/15	

KAJ 6-30-15

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 14:35
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-5	**Units:**	ug/L
Lab Code:	J1504770-005	**Basis:**	NA

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3510C

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 14:20	6/15/15	
2-Methylnaphthalene	0.0440 U	0.100	0.0440	1	06/17/15 14:20	6/15/15	
Acenaphthene	0.0410 U	0.100	0.0410	1	06/17/15 14:20	6/15/15	
Acenaphthylene	0.0250 U	0.100	0.0250	1	06/17/15 14:20	6/15/15	
Anthracene	0.0380 U	0.100	0.0380	1	06/17/15 14:20	6/15/15	
Benz(a)anthracene	0.0350 U	0.100	0.0350	1	06/17/15 14:20	6/15/15	
Benzo(a)pyrene	0.0310 U	0.100	0.0310	1	06/17/15 14:20	6/15/15	
Benzo(b)fluoranthene	0.0250 U	0.100	0.0250	1	06/17/15 14:20	6/15/15	
Benzo(g,h,i)perylene	0.0390 U	0.100	0.0390	1	06/17/15 14:20	6/15/15	
Benzo(k)fluoranthene	0.0350 U	0.100	0.0350	1	06/17/15 14:20	6/15/15	
Chrysene	0.0240 U	0.100	0.0240	1	06/17/15 14:20	6/15/15	
Dibenz(a,h)anthracene	0.0360 U	0.100	0.0360	1	06/17/15 14:20	6/15/15	
Fluoranthene	0.0390 U	0.100	0.0390	1	06/17/15 14:20	6/15/15	
Fluorene	0.0470 U	0.100	0.0470	1	06/17/15 14:20	6/15/15	
Indeno(1,2,3-cd)pyrene	0.0400 U	0.100	0.0400	1	06/17/15 14:20	6/15/15	
Naphthalene	0.0390 U	0.100	0.0390	1	06/17/15 14:20	6/15/15	
Pentachlorophenol (PCP)	0.0390 U	1.00	0.0390	1	06/17/15 14:20	6/15/15	
Phenanthrene	0.0350 U	0.100	0.0350	1	06/17/15 14:20	6/15/15	
Pyrene	0.0310 U	0.100	0.0310	1	06/17/15 14:20	6/15/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	83	11 - 163	06/17/15 14:20	
2-Fluorobiphenyl	65	22 - 105	06/17/15 14:20	
p-Terphenyl-d14	72	25 - 127	06/17/15 14:20	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 14:35
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-5	**Basis:**	NA
Lab Code:	J1504770-005		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	**4.9**	ug/L	1.0	0.5	1	06/16/15 21:07	06/16/15	
Calcium, Total Recoverable	6010B	**2.28**	mg/L	0.10	0.02	1	06/16/15 06:18	06/15/15	
Chromium, Total Recoverable	6020	**1.7**	ug/L	1.0	0.2	1	06/16/15 21:07	06/16/15	
Copper, Total Recoverable	6020	**1.0 J**	ug/L	1.0	0.3	1	06/16/15 21:07	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	**7.8**	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**0.51**	mg/L	0.10	0.02	1	06/16/15 06:18	06/15/15	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/08/15 17:50
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SW-6	**Units:**	ug/L
Lab Code:	J1504770-006	**Basis:**	NA

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3510C

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	0.0474 U	0.108	0.0474	1	06/17/15 14:44	6/15/15	
2-Methylnaphthalene	0.0474 U	0.108	0.0474	1	06/17/15 14:44	6/15/15	
Acenaphthene	0.0441 U	0.108	0.0441	1	06/17/15 14:44	6/15/15	
Acenaphthylene	0.0269 U	0.108	0.0269	1	06/17/15 14:44	6/15/15	
Anthracene	**0.0445 J**	0.108	0.0409	1	06/17/15 14:44	6/15/15	
Benz(a)anthracene	0.0377 U	0.108	0.0377	1	06/17/15 14:44	6/15/15	
Benzo(a)pyrene	0.0334 U	0.108	0.0334	1	06/17/15 14:44	6/15/15	
Benzo(b)fluoranthene	0.0269 U	0.108	0.0269	1	06/17/15 14:44	6/15/15	
Benzo(g,h,i)perylene	0.0420 U	0.108	0.0420	1	06/17/15 14:44	6/15/15	
Benzo(k)fluoranthene	0.0377 U	0.108	0.0377	1	06/17/15 14:44	6/15/15	
Chrysene	0.0259 U	0.108	0.0259	1	06/17/15 14:44	6/15/15	
Dibenz(a,h)anthracene	0.0388 U	0.108	0.0388	1	06/17/15 14:44	6/15/15	
Fluoranthene	0.0420 U	0.108	0.0420	1	06/17/15 14:44	6/15/15	
Fluorene	0.0506 U	0.108	0.0506	1	06/17/15 14:44	6/15/15	
Indeno(1,2,3-cd)pyrene	0.0431 U	0.108	0.0431	1	06/17/15 14:44	6/15/15	
Naphthalene	0.0420 U	0.108	0.0420	1	06/17/15 14:44	6/15/15	
Pentachlorophenol (PCP)	**1.42**	1.08	0.0420	1	06/17/15 14:44	6/15/15	
Phenanthrene	0.0377 U	0.108	0.0377	1	06/17/15 14:44	6/15/15	
Pyrene	0.0334 U	0.108	0.0334	1	06/17/15 14:44	6/15/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	81	11 - 163	06/17/15 14:44	
2-Fluorobiphenyl	67	22 - 105	06/17/15 14:44	
p-Terphenyl-d14	67	25 - 127	06/17/15 14:44	

KP 6.30.15

Analytical Report

Client: EarthCon Site Services Inc
Project: IP Wiggins Church House Branch CMS/02.20020008.15
Sample Matrix: Water

Service Request: J1504770
Date Collected: 06/08/15 17:50
Date Received: 06/11/15 10:00

Sample Name: SW-6
Lab Code: J1504770-006

Basis: NA

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	**32.1** J	ug/L	1.0	0.5	1	06/16/15 21:12	06/16/15	
Calcium, Total Recoverable	6010B	**5.47**	mg/L	0.10	0.02	1	06/16/15 06:22	06/15/15	
Chromium, Total Recoverable	6020	**63.7**	ug/L	1.0	0.2	1	06/16/15 21:12	06/16/15	
Copper, Total Recoverable	6020	**46.2**	ug/L	1.0	0.3	1	06/16/15 21:12	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	**21.0**	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**1.78**	mg/L	0.10	0.02	1	06/16/15 06:23	06/15/15	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:05
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-10	**Units:**	ug/Kg
Lab Code:	J1504770-007	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.90 U	4.90	3.90	1	06/18/15 16:10	6/18/15	
2-Methylnaphthalene	3.32 U	4.90	3.32	1	06/18/15 16:10	6/18/15	
Acenaphthene	4.47 U	9.80	4.47	1	06/18/15 16:10	6/18/15	
Acenaphthylene	3.18 U	9.80	3.18	1	06/18/15 16:10	6/18/15	
Anthracene	2.31 U	4.90	2.31	1	06/18/15 16:10	6/18/15	
Benz(a)anthracene	2.74 U	4.90	2.74	1	06/18/15 16:10	6/18/15	
Benzo(a)pyrene	1.45 U	4.90	1.45	1	06/18/15 16:10	6/18/15	
Benzo(b)fluoranthene	2.89 U	4.90	2.89	1	06/18/15 16:10	6/18/15	
Benzo(g,h,i)perylene	3.18 U	4.90	3.18	1	06/18/15 16:10	6/18/15	
Benzo(k)fluoranthene	3.47 U	4.90	3.47	1	06/18/15 16:10	6/18/15	
Chrysene	2.74 U	4.90	2.74	1	06/18/15 16:10	6/18/15	
Dibenz(a,h)anthracene	3.90 U	4.90	3.90	1	06/18/15 16:10	6/18/15	
Fluoranthene	**3.57 J**	4.90	2.89	1	06/18/15 16:10	6/18/15	
Fluorene	3.18 U	4.90	3.18	1	06/18/15 16:10	6/18/15	
Indeno(1,2,3-cd)pyrene	3.18 U	4.90	3.18	1	06/18/15 16:10	6/18/15	
Naphthalene	4.47 U	4.90	4.47	1	06/18/15 16:10	6/18/15	
Pentachlorophenol (PCP)	**89.3**	49.0	21.7	1	06/18/15 16:10	6/18/15	
Phenanthrene	2.46 U	9.80	2.46	1	06/18/15 16:10	6/18/15	
Pyrene	**3.53 J**	4.90	2.89	1	06/18/15 16:10	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	81	34 - 166	06/18/15 16:10	
2-Fluorobiphenyl	67	30 - 118	06/18/15 16:10	
p-Terphenyl-d14	72	41 - 146	06/18/15 16:10	

KJO 6-30-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:05
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-10	**Basis:**	Dry
Lab Code:	J1504770-007		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**1.53**	mg/Kg	0.45	0.12	1	06/18/15 19:27	06/17/15	
Chromium, Total Recoverable	6010B	**4.41**	mg/Kg	0.45	0.02	1	06/18/15 19:27	06/17/15	
Copper, Total Recoverable	6010B	**1.80**	mg/Kg	0.45	0.07	1	06/18/15 19:27	06/17/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:05
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-10	**Basis:**	Dry
Lab Code:	J1504770-007		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**5420**	mg/Kg	590	110	1	06/18/15 11:21	

FQP 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:05
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-10	**Basis:**	As Received
Lab Code:	J1504770-007		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**74**	Percent	0.10	0.10	1	06/24/15 15:46	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:10
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-9	**Units:**	ug/Kg
Lab Code:	J1504770-008	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.37 U	4.23	3.37	1	06/18/15 16:34	6/18/15	
2-Methylnaphthalene	2.87 U	4.23	2.87	1	06/18/15 16:34	6/18/15	
Acenaphthene	3.87 U	8.47	3.87	1	06/18/15 16:34	6/18/15	
Acenaphthylene	2.75 U	8.47	2.75	1	06/18/15 16:34	6/18/15	
Anthracene	2.00 U	4.23	2.00	1	06/18/15 16:34	6/18/15	
Benz(a)anthracene	2.37 U	4.23	2.37	1	06/18/15 16:34	6/18/15	
Benzo(a)pyrene	1.25 U	4.23	1.25	1	06/18/15 16:34	6/18/15	
Benzo(b)fluoranthene	2.50 U	4.23	2.50	1	06/18/15 16:34	6/18/15	
Benzo(g,h,i)perylene	2.75 U	4.23	2.75	1	06/18/15 16:34	6/18/15	
Benzo(k)fluoranthene	2.99 U	4.23	2.99	1	06/18/15 16:34	6/18/15	
Chrysene	2.37 U	4.23	2.37	1	06/18/15 16:34	6/18/15	
Dibenz(a,h)anthracene	3.37 U	4.23	3.37	1	06/18/15 16:34	6/18/15	
Fluoranthene	2.50 U	4.23	2.50	1	06/18/15 16:34	6/18/15	
Fluorene	2.75 U	4.23	2.75	1	06/18/15 16:34	6/18/15	
Indeno(1,2,3-cd)pyrene	2.75 U	4.23	2.75	1	06/18/15 16:34	6/18/15	
Naphthalene	3.87 U	4.23	3.87	1	06/18/15 16:34	6/18/15	
Pentachlorophenol (PCP)	**54.8**	42.3	18.7	1	06/18/15 16:34	6/18/15	
Phenanthrene	2.12 U	8.47	2.12	1	06/18/15 16:34	6/18/15	
Pyrene	2.50 U	4.23	2.50	1	06/18/15 16:34	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	75	34 - 166	06/18/15 16:34	
2-Fluorobiphenyl	60	30 - 118	06/18/15 16:34	
p-Terphenyl-d14	67	41 - 146	06/18/15 16:34	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:10
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-9	**Basis:**	Dry
Lab Code:	J1504770-008		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**1.10**	mg/Kg	0.35	0.12	1	06/18/15 19:41	06/17/15	
Chromium, Total Recoverable	6010B	**4.25**	mg/Kg	0.35	0.02	1	06/18/15 19:41	06/17/15	
Copper, Total Recoverable	6010B	**1.35**	mg/Kg	0.35	0.07	1	06/18/15 19:41	06/17/15	

6/30/15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:10
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-9	**Basis:**	Dry
Lab Code:	J1504770-008		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**1140**	mg/Kg	570	110	1	06/18/15 11:27	

KP 7-1-15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:10
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-9	**Basis:**	As Received
Lab Code:	J1504770-008		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**78**	Percent	0.10	0.10	1	06/24/15 15:46	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:15
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-8	**Units:**	ug/Kg
Lab Code:	J1504770-009	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	8.52 U	10.7	8.52	2	06/18/15 16:59	6/18/15	
2-Methylnaphthalene	7.26 U	10.7	7.26	2	06/18/15 16:59	6/18/15	
Acenaphthene	9.78 U	21.5	9.78	2	06/18/15 16:59	6/18/15	
Acenaphthylene	6.95 U	21.5	6.95	2	06/18/15 16:59	6/18/15	
Anthracene	5.05 U	10.7	5.05	2	06/18/15 16:59	6/18/15	
Benz(a)anthracene	6.00 U	10.7	6.00	2	06/18/15 16:59	6/18/15	
Benzo(a)pyrene	3.16 U	10.7	3.16	2	06/18/15 16:59	6/18/15	
Benzo(b)fluoranthene	6.31 U	10.7	6.31	2	06/18/15 16:59	6/18/15	
Benzo(g,h,i)perylene	6.95 U	10.7	6.95	2	06/18/15 16:59	6/18/15	
Benzo(k)fluoranthene	7.58 U	10.7	7.58	2	06/18/15 16:59	6/18/15	
Chrysene	6.00 U	10.7	6.00	2	06/18/15 16:59	6/18/15	
Dibenz(a,h)anthracene	8.52 U	10.7	8.52	2	06/18/15 16:59	6/18/15	
Fluoranthene	6.31 U	10.7	6.31	2	06/18/15 16:59	6/18/15	
Fluorene	6.95 U	10.7	6.95	2	06/18/15 16:59	6/18/15	
Indeno(1,2,3-cd)pyrene	6.95 U	10.7	6.95	2	06/18/15 16:59	6/18/15	
Naphthalene	9.78 U	10.7	9.78	2	06/18/15 16:59	6/18/15	
Pentachlorophenol (PCP)	**119**	107	47.4	2	06/18/15 16:59	6/18/15	
Phenanthrene	5.37 U	21.5	5.37	2	06/18/15 16:59	6/18/15	
Pyrene	6.31 U	10.7	6.31	2	06/18/15 16:59	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	93	34 - 166	06/18/15 16:59	
2-Fluorobiphenyl	67	30 - 118	06/18/15 16:59	
p-Terphenyl-d14	71	41 - 146	06/18/15 16:59	

KJ 6-30-15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:15
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-8	**Basis:**	Dry
Lab Code:	J1504770-009		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**1.59**	mg/Kg	0.69	0.16	1	06/18/15 19:45	06/17/15	
Chromium, Total Recoverable	6010B	**7.14**	mg/Kg	0.69	0.03	1	06/18/15 19:45	06/17/15	
Copper, Total Recoverable	6010B	**2.70**	mg/Kg	0.69	0.09	1	06/18/15 19:45	06/17/15	

6/30/15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:15
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-8	**Basis:**	Dry
Lab Code:	J1504770-009		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	140 U	mg/Kg	720	140	1	06/18/15 11:36	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:15
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-8	**Basis:**	As Received
Lab Code:	J1504770-009		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**65**	Percent	0.10	0.10	1	06/24/15 15:46	

KP 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:25
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-7	**Units:**	ug/Kg
Lab Code:	J1504770-010	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.27 U	4.11	3.27	1	06/18/15 17:23	6/18/15	
2-Methylnaphthalene	2.79 U	4.11	2.79	1	06/18/15 17:23	6/18/15	
Acenaphthene	3.75 U	8.23	3.75	1	06/18/15 17:23	6/18/15	
Acenaphthylene	2.67 U	8.23	2.67	1	06/18/15 17:23	6/18/15	
Anthracene	1.94 U	4.11	1.94	1	06/18/15 17:23	6/18/15	
Benz(a)anthracene	2.30 U	4.11	2.30	1	06/18/15 17:23	6/18/15	
Benzo(a)pyrene	1.21 U	4.11	1.21	1	06/18/15 17:23	6/18/15	
Benzo(b)fluoranthene	2.42 U	4.11	2.42	1	06/18/15 17:23	6/18/15	
Benzo(g,h,i)perylene	2.67 U	4.11	2.67	1	06/18/15 17:23	6/18/15	
Benzo(k)fluoranthene	2.91 U	4.11	2.91	1	06/18/15 17:23	6/18/15	
Chrysene	2.30 U	4.11	2.30	1	06/18/15 17:23	6/18/15	
Dibenz(a,h)anthracene	3.27 U	4.11	3.27	1	06/18/15 17:23	6/18/15	
Fluoranthene	2.42 U	4.11	2.42	1	06/18/15 17:23	6/18/15	
Fluorene	2.67 U	4.11	2.67	1	06/18/15 17:23	6/18/15	
Indeno(1,2,3-cd)pyrene	2.67 U	4.11	2.67	1	06/18/15 17:23	6/18/15	
Naphthalene	3.75 U	4.11	3.75	1	06/18/15 17:23	6/18/15	
Pentachlorophenol (PCP)	18.2 U	41.1	18.2	1	06/18/15 17:23	6/18/15	
Phenanthrene	2.06 U	8.23	2.06	1	06/18/15 17:23	6/18/15	
Pyrene	2.42 U	4.11	2.42	1	06/18/15 17:23	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	89	34 - 166	06/18/15 17:23	
2-Fluorobiphenyl	69	30 - 118	06/18/15 17:23	
p-Terphenyl-d14	78	41 - 146	06/18/15 17:23	

KJD 6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:25
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-7	**Basis:**	Dry
Lab Code:	J1504770-010		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	0.12 U	mg/Kg	0.48	0.12	1	06/18/15 19:49	06/17/15	
Chromium, Total Recoverable	6010B	**1.25**	mg/Kg	0.48	0.02	1	06/18/15 19:49	06/17/15	
Copper, Total Recoverable	6010B	0.48 ~~0.29 J~~ U	mg/Kg	0.48	0.07	1	06/18/15 19:49	06/17/15	

KAQ 6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:25
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-7	**Basis:**	Dry
Lab Code:	J1504770-010		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	110 U	mg/Kg	570	110	1	06/18/15 11:50	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:25
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-7	**Basis:**	As Received
Lab Code:	J1504770-010		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**80**	Percent	0.10	0.10	1	06/24/15 15:46	

KP 7-1-15

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Analytical Report

Client:	EarthCon Site Services Inc		
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Service Request:**	J1504770
Sample Matrix:	Soil	**Date Collected:**	06/09/15 13:40
		Date Received:	06/11/15 10:00
Sample Name:	Soil 5		
Lab Code:	J1504770-011	**Units:**	ug/Kg
		Basis:	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.46 U	4.35	3.46	1	06/18/15 17:47	6/18/15	
2-Methylnaphthalene	2.95 U	4.35	2.95	1	06/18/15 17:47	6/18/15	
Acenaphthene	3.97 U	8.70	3.97	1	06/18/15 17:47	6/18/15	
Acenaphthylene	**4.12 J**	8.70	2.82	1	06/18/15 17:47	6/18/15	
Anthracene	**6.48**	4.35	2.05	1	06/18/15 17:47	6/18/15	
Benz(a)anthracene	2.43 U	4.35	2.43	1	06/18/15 17:47	6/18/15	
Benzo(a)pyrene	**17.5**	4.35	1.28	1	06/18/15 17:47	6/18/15	
Benzo(b)fluoranthene	**39.6**	4.35	2.56	1	06/18/15 17:47	6/18/15	
Benzo(g,h,i)perylene	**7.38**	4.35	2.82	1	06/18/15 17:47	6/18/15	
Benzo(k)fluoranthene	**17.4**	4.35	3.07	1	06/18/15 17:47	6/18/15	
Chrysene	**16.3**	4.35	2.43	1	06/18/15 17:47	6/18/15	
Dibenz(a,h)anthracene	3.46 U	4.35	3.46	1	06/18/15 17:47	6/18/15	
Fluoranthene	**14.0**	4.35	2.56	1	06/18/15 17:47	6/18/15	
Fluorene	2.82 U	4.35	2.82	1	06/18/15 17:47	6/18/15	
Indeno(1,2,3-cd)pyrene	**7.10**	4.35	2.82	1	06/18/15 17:47	6/18/15	
Naphthalene	3.97 U	4.35	3.97	1	06/18/15 17:47	6/18/15	
Pentachlorophenol (PCP)	**1310**	43.5	19.2	1	06/18/15 17:47	6/18/15	
Phenanthrene	2.18 U	8.70	2.18	1	06/18/15 17:47	6/18/15	
Pyrene	**23.0**	4.35	2.56	1	06/18/15 17:47	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	83	34 - 166	06/18/15 17:47	
2-Fluorobiphenyl	57	30 - 118	06/18/15 17:47	
p-Terphenyl-d14	36	41 - 146	06/18/15 17:47	*

KJS 6.30.15

Client: EarthCon Site Services Inc
Project: IP Wiggins Church House Branch CMS/02.20020008.15
Sample Matrix: Soil

Service Request: J1504770
Date Collected: 06/09/15 13:40
Date Received: 06/11/15 10:00

Sample Name: Soil 5
Lab Code: J1504770-011

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**6.02**	mg/Kg	0.52	0.13	1	06/18/15 19:53	06/17/15	
Chromium, Total Recoverable	6010B	**11.2**	mg/Kg	0.52	0.02	1	06/18/15 19:53	06/17/15	
Copper, Total Recoverable	6010B	**6.75**	mg/Kg	0.52	0.07	1	06/18/15 19:53	06/17/15	

FSP 6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:40
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 5	**Basis:**	Dry
Lab Code:	J1504770-011		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**9990**	mg/Kg	580	110	1	06/18/15 11:58	

KJ 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:40
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 5	**Basis:**	As Received
Lab Code:	J1504770-011		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**81**	Percent	0.10	0.10	1	06/24/15 15:46	

7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 14:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 4	**Units:**	ug/Kg
Lab Code:	J1504770-012	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	20.0 U	25.2	20.0	5	06/18/15 18:11	6/18/15	
2-Methylnaphthalene	17.1 U	25.2	17.1	5	06/18/15 18:11	6/18/15	
Acenaphthene	23.0 U	50.3	23.0	5	06/18/15 18:11	6/18/15	
Acenaphthylene	16.3 U	50.3	16.3	5	06/18/15 18:11	6/18/15	
Anthracene	**13.7 J**	25.2	11.9	5	06/18/15 18:11	6/18/15	
Benz(a)anthracene	14.1 U	25.2	14.1	5	06/18/15 18:11	6/18/15	
Benzo(a)pyrene	7.41 U	25.2	7.41	5	06/18/15 18:11	6/18/15	
Benzo(b)fluoranthene	**82.2**	25.2	14.9	5	06/18/15 18:11	6/18/15	
Benzo(g,h,i)perylene	16.3 U	25.2	16.3	5	06/18/15 18:11	6/18/15	
Benzo(k)fluoranthene	17.8 U	25.2	17.8	5	06/18/15 18:11	6/18/15	
Chrysene	**32.3**	25.2	14.1	5	06/18/15 18:11	6/18/15	
Dibenz(a,h)anthracene	20.0 U	25.2	20.0	5	06/18/15 18:11	6/18/15	
Fluoranthene	**65.3**	25.2	14.9	5	06/18/15 18:11	6/18/15	
Fluorene	16.3 U	25.2	16.3	5	06/18/15 18:11	6/18/15	
Indeno(1,2,3-cd)pyrene	16.3 U	25.2	16.3	5	06/18/15 18:11	6/18/15	
Naphthalene	23.0 U	25.2	23.0	5	06/18/15 18:11	6/18/15	
Pentachlorophenol (PCP)	**491**	252	112	5	06/18/15 18:11	6/18/15	
Phenanthrene	12.6 U	50.3	12.6	5	06/18/15 18:11	6/18/15	
Pyrene	**54.8**	25.2	14.9	5	06/18/15 18:11	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	139	34 - 166	06/18/15 18:11	
2-Fluorobiphenyl	75	30 - 118	06/18/15 18:11	
p-Terphenyl-d14	64	41 - 146	06/18/15 18:11	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 14:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 4	**Basis:**	Dry
Lab Code:	J1504770-012		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**15.9**	mg/Kg	0.56	0.13	1	06/18/15 19:57	06/17/15	
Chromium, Total Recoverable	6010B	**36.9**	mg/Kg	0.56	0.03	1	06/18/15 19:57	06/17/15	
Copper, Total Recoverable	6010B	**17.9**	mg/Kg	0.56	0.07	1	06/18/15 19:57	06/17/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 14:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 4	**Basis:**	Dry
Lab Code:	J1504770-012		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**14000**	mg/Kg	1200	300	1	06/18/15 12:13	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 14:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 4	**Basis:**	As Received
Lab Code:	J1504770-012		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	71	Percent	0.10	0.10	1	06/24/15 15:46	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 15:45
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	Soil EB	**Basis:**	NA
Lab Code:	J1504770-013		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	0.5 U	ug/L	1.0	0.5	1	06/16/15 21:17	06/16/15	
Calcium, Total Recoverable	6010B	**5.34**	mg/L	0.10	0.02	1	06/16/15 06:27	06/15/15	
Chromium, Total Recoverable	6020	**0.2 J**	ug/L	1.0	0.2	1	06/16/15 21:17	06/16/15	
Copper, Total Recoverable	6020	0.3 U	ug/L	1.0	0.3	1	06/16/15 21:17	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	**25.1**	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**2.85**	mg/L	0.10	0.02	1	06/16/15 06:28	06/15/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 15:45
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	Soil EB	**Basis:**	NA
Lab Code:	J1504770-013		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060	**1.3**	mg/L	1.0	0.09	1	06/19/15 20:30	

RJ 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 2	**Units:**	ug/Kg
Lab Code:	J1504770-014	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.48 U	4.38	3.48	1	06/18/15 18:36	6/18/15	
2-Methylnaphthalene	2.97 U	4.38	2.97	1	06/18/15 18:36	6/18/15	
Acenaphthene	4.00 U	8.76	4.00	1	06/18/15 18:36	6/18/15	
Acenaphthylene	2.84 U	8.76	2.84	1	06/18/15 18:36	6/18/15	
Anthracene	**17.4**	4.38	2.07	1	06/18/15 18:36	6/18/15	
Benz(a)anthracene	2.45 U	4.38	2.45	1	06/18/15 18:36	6/18/15	
Benzo(a)pyrene	1.29 U	4.38	1.29	1	06/18/15 18:36	6/18/15	
Benzo(b)fluoranthene	**10.8**	4.38	2.58	1	06/18/15 18:36	6/18/15	
Benzo(g,h,i)perylene	2.84 U	4.38	2.84	1	06/18/15 18:36	6/18/15	
Benzo(k)fluoranthene	3.10 U	4.38	3.10	1	06/18/15 18:36	6/18/15	
Chrysene	2.45 U	4.38	2.45	1	06/18/15 18:36	6/18/15	
Dibenz(a,h)anthracene	3.48 U	4.38	3.48	1	06/18/15 18:36	6/18/15	
Fluoranthene	**4.14 J** J	4.38	2.58	1	06/18/15 18:36	6/18/15	
Fluorene	2.84 U	4.38	2.84	1	06/18/15 18:36	6/18/15	
Indeno(1,2,3-cd)pyrene	2.84 U	4.38	2.84	1	06/18/15 18:36	6/18/15	
Naphthalene	4.00 U	4.38	4.00	1	06/18/15 18:36	6/18/15	
Pentachlorophenol (PCP)	**2020**	438	194	10	06/24/15 19:20	6/18/15	
Phenanthrene	2.19 U	8.76	2.19	1	06/18/15 18:36	6/18/15	
Pyrene	**4.41** J	4.38	2.58	1	06/18/15 18:36	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	92	34 - 166	06/18/15 18:36	
2-Fluorobiphenyl	65	30 - 118	06/18/15 18:36	
p-Terphenyl-d14	50	41 - 146	06/18/15 18:36	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 2	**Basis:**	Dry
Lab Code:	J1504770-014		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**3.59**	mg/Kg	0.60	0.14	1	06/18/15 20:06	06/17/15	
Chromium, Total Recoverable	6010B	**11.7**	mg/Kg	0.60	0.03	1	06/18/15 20:06	06/17/15	
Copper, Total Recoverable	6010B	**3.65**	mg/Kg	0.60	0.08	1	06/18/15 20:06	06/17/15	

6.30.15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 2	**Basis:**	Dry
Lab Code:	J1504770-014		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**16000** J	mg/Kg	590	110	1	06/18/15 13:56	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:30
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 2	**Basis:**	As Received
Lab Code:	J1504770-014		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**82**	Percent	0.10	0.10	1	06/24/15 15:46	

FQ 7-7-15

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Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:45
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 3	**Units:**	ug/Kg
Lab Code:	J1504770-015	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.30 U	4.15	3.30	1	06/18/15 19:48	6/18/15	
2-Methylnaphthalene	2.81 U	4.15	2.81	1	06/18/15 19:48	6/18/15	
Acenaphthene	3.79 U	8.30	3.79	1	06/18/15 19:48	6/18/15	
Acenaphthylene	2.69 U	8.30	2.69	1	06/18/15 19:48	6/18/15	
Anthracene	1.96 U	4.15	1.96	1	06/18/15 19:48	6/18/15	
Benz(a)anthracene	2.32 U	4.15	2.32	1	06/18/15 19:48	6/18/15	
Benzo(a)pyrene	1.23 U	4.15	1.23	1	06/18/15 19:48	6/18/15	
Benzo(b)fluoranthene	**15.7**	4.15	2.45	1	06/18/15 19:48	6/18/15	
Benzo(g,h,i)perylene	2.69 U	4.15	2.69	1	06/18/15 19:48	6/18/15	
Benzo(k)fluoranthene	2.93 U	4.15	2.93	1	06/18/15 19:48	6/18/15	
Chrysene	**6.31**	4.15	2.32	1	06/18/15 19:48	6/18/15	
Dibenz(a,h)anthracene	3.30 U	4.15	3.30	1	06/18/15 19:48	6/18/15	
Fluoranthene	**5.74**	4.15	2.45	1	06/18/15 19:48	6/18/15	
Fluorene	2.69 U	4.15	2.69	1	06/18/15 19:48	6/18/15	
Indeno(1,2,3-cd)pyrene	2.69 U	4.15	2.69	1	06/18/15 19:48	6/18/15	
Naphthalene	3.79 U	4.15	3.79	1	06/18/15 19:48	6/18/15	
Pentachlorophenol (PCP)	**73.8**	41.5	18.4	1	06/18/15 19:48	6/18/15	
Phenanthrene	2.08 U	8.30	2.08	1	06/18/15 19:48	6/18/15	
Pyrene	**6.02**	4.15	2.45	1	06/18/15 19:48	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	84	34 - 166	06/18/15 19:48	
2-Fluorobiphenyl	62	30 - 118	06/18/15 19:48	
p-Terphenyl-d14	60	41 - 146	06/18/15 19:48	

6/30/15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:45
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 3	**Basis:**	Dry
Lab Code:	J1504770-015		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**1.48**	mg/Kg	0.42	0.12	1	06/18/15 20:10	06/17/15	
Chromium, Total Recoverable	6010B	**2.84**	mg/Kg	0.42	0.02	1	06/18/15 20:10	06/17/15	
Copper, Total Recoverable	6010B	**1.48**	mg/Kg	0.42	0.07	1	06/18/15 20:10	06/17/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:45
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 3	**Basis:**	Dry
Lab Code:	J1504770-015		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**760**	mg/Kg	570	110	1	06/18/15 14:14	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 16:45
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 3	**Basis:**	As Received
Lab Code:	J1504770-015		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**85**	Percent	0.10	0.10	1	06/24/15 15:46	

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Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:20
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 1	**Units:**	ug/Kg
Lab Code:	J1504770-016	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.46 U	4.36	3.46	1	06/18/15 20:12	6/18/15	
2-Methylnaphthalene	2.95 U	4.36	2.95	1	06/18/15 20:12	6/18/15	
Acenaphthene	3.98 U	8.71	3.98	1	06/18/15 20:12	6/18/15	
Acenaphthylene	**9.81** J	8.71	2.82	1	06/18/15 20:12	6/18/15	
Anthracene	**27.1**	4.36	2.05	1	06/18/15 20:12	6/18/15	
Benz(a)anthracene	2.44 U	4.36	2.44	1	06/18/15 20:12	6/18/15	
Benzo(a)pyrene	**20.6**	4.36	1.29	1	06/18/15 20:12	6/18/15	
Benzo(b)fluoranthene	**47.5** J	4.36	2.57	1	06/18/15 20:12	6/18/15	
Benzo(g,h,i)perylene	**11.6** J	4.36	2.82	1	06/18/15 20:12	6/18/15	
Benzo(k)fluoranthene	**19.5**	4.36	3.08	1	06/18/15 20:12	6/18/15	
Chrysene	**11.0**	4.36	2.44	1	06/18/15 20:12	6/18/15	
Dibenz(a,h)anthracene	3.46 U	4.36	3.46	1	06/18/15 20:12	6/18/15	
Fluoranthene	**16.9** J	4.36	2.57	1	06/18/15 20:12	6/18/15	
Fluorene	**3.15** J	4.36	2.82	1	06/18/15 20:12	6/18/15	
Indeno(1,2,3-cd)pyrene	**12.6** J	4.36	2.82	1	06/18/15 20:12	6/18/15	
Naphthalene	3.98 U	4.36	3.98	1	06/18/15 20:12	6/18/15	
Pentachlorophenol (PCP)	**1150**	43.6	19.3	1	06/18/15 20:12	6/18/15	
Phenanthrene	2.18 U	8.71	2.18	1	06/18/15 20:12	6/18/15	
Pyrene	**45.8**	4.36	2.57	1	06/18/15 20:12	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	87	34 - 166	06/18/15 20:12	
2-Fluorobiphenyl	60	30 - 118	06/18/15 20:12	
p-Terphenyl-d14	63	41 - 146	06/18/15 20:12	

KAJ 6/30/15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:20
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 1	**Basis:**	Dry
Lab Code:	J1504770-016		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**16.3**	mg/Kg	0.55	0.13	1	06/18/15 20:14	06/17/15	
Chromium, Total Recoverable	6010B	**9.50**	mg/Kg	0.55	0.03	1	06/18/15 20:14	06/17/15	
Copper, Total Recoverable	6010B	**36.1**	mg/Kg	0.55	0.07	1	06/18/15 20:14	06/17/15	

6/30/15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:20
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 1	**Basis:**	Dry
Lab Code:	J1504770-016		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**1920** J-	mg/Kg	590	110	1	06/18/15 14:22	

KP 7-1-15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:20
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 1	**Basis:**	As Received
Lab Code:	J1504770-016		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**82**	Percent	0.10	0.10	1	06/24/15 15:46	

KQY 7/7/15

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Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:25
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 6	**Units:**	ug/Kg
Lab Code:	J1504770-017	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.60 U	4.53	3.60	1	06/18/15 20:37	6/18/15	
2-Methylnaphthalene	3.07 U	4.53	3.07	1	06/18/15 20:37	6/18/15	
Acenaphthene	4.13 U	9.06	4.13	1	06/18/15 20:37	6/18/15	
Acenaphthylene	**3.53 J** J	9.06	2.93	1	06/18/15 20:37	6/18/15	
Anthracene	2.14 U	4.53	2.14	1	06/18/15 20:37	6/18/15	
Benz(a)anthracene	2.54 U	4.53	2.54	1	06/18/15 20:37	6/18/15	
Benzo(a)pyrene	**15.1**	4.53	1.34	1	06/18/15 20:37	6/18/15	
Benzo(b)fluoranthene	**25.1** J	4.53	2.67	1	06/18/15 20:37	6/18/15	
Benzo(g,h,i)perylene	**4.74** J	4.53	2.93	1	06/18/15 20:37	6/18/15	
Benzo(k)fluoranthene	**13.9**	4.53	3.20	1	06/18/15 20:37	6/18/15	
Chrysene	2.54 U	4.53	2.54	1	06/18/15 20:37	6/18/15	
Dibenz(a,h)anthracene	3.60 U	4.53	3.60	1	06/18/15 20:37	6/18/15	
Fluoranthene	**6.03** J	4.53	2.67	1	06/18/15 20:37	6/18/15	
Fluorene	2.93 U	4.53	2.93	1	06/18/15 20:37	6/18/15	
Indeno(1,2,3-cd)pyrene	**5.22** J	4.53	2.93	1	06/18/15 20:37	6/18/15	
Naphthalene	4.13 U	4.53	4.13	1	06/18/15 20:37	6/18/15	
Pentachlorophenol (PCP)	**1010**	45.3	20.0	1	06/18/15 20:37	6/18/15	
Phenanthrene	2.27 U	9.06	2.27	1	06/18/15 20:37	6/18/15	
Pyrene	**30.2**	4.53	2.67	1	06/18/15 20:37	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	88	34 - 166	06/18/15 20:37	
2-Fluorobiphenyl	60	30 - 118	06/18/15 20:37	
p-Terphenyl-d14	66	41 - 146	06/18/15 20:37	

KJ 6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:25
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 6	**Basis:**	Dry
Lab Code:	J1504770-017		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**11.4**	mg/Kg	0.53	0.13	1	06/18/15 20:18	06/17/15	
Chromium, Total Recoverable	6010B	**7.26**	mg/Kg	0.53	0.03	1	06/18/15 20:18	06/17/15	
Copper, Total Recoverable	6010B	**24.8**	mg/Kg	0.53	0.07	1	06/18/15 20:18	06/17/15	

KQV 6.30.15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:25
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 6	**Basis:**	Dry
Lab Code:	J1504770-017		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**1100** J	mg/Kg	590	110	1	06/18/15 14:29	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:25
Sample Matrix:	Soil	**Date Received:**	06/11/15 10:00
Sample Name:	Soil 6	**Basis:**	As Received
Lab Code:	J1504770-017		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**80**	Percent	0.10	0.10	1	06/24/15 15:46	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 09:50
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-11	**Units:**	ug/Kg
Lab Code:	J1504770-018	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	**7.93**	7.42	5.90	1	06/18/15 21:01	6/18/15	
2-Methylnaphthalene	**13.5** J	7.42	5.03	1	06/18/15 21:01	6/18/15	
Acenaphthene	**33.5**	14.8	6.77	1	06/18/15 21:01	6/18/15	
Acenaphthylene	**5.85 J**	14.8	4.81	1	06/18/15 21:01	6/18/15	
Anthracene	**21.1**	7.42	3.50	1	06/18/15 21:01	6/18/15	
Benz(a)anthracene	4.15 U	7.42	4.15	1	06/18/15 21:01	6/18/15	
Benzo(a)pyrene	2.19 U	7.42	2.19	1	06/18/15 21:01	6/18/15	
Benzo(b)fluoranthene	4.37 U	7.42	4.37	1	06/18/15 21:01	6/18/15	
Benzo(g,h,i)perylene	4.81 U	7.42	4.81	1	06/18/15 21:01	6/18/15	
Benzo(k)fluoranthene	5.25 U	7.42	5.25	1	06/18/15 21:01	6/18/15	
Chrysene	**4.36 J**	7.42	4.15	1	06/18/15 21:01	6/18/15	
Dibenz(a,h)anthracene	5.90 U	7.42	5.90	1	06/18/15 21:01	6/18/15	
Fluoranthene	**63.0**	7.42	4.37	1	06/18/15 21:01	6/18/15	
Fluorene	**22.0**	7.42	4.81	1	06/18/15 21:01	6/18/15	
Indeno(1,2,3-cd)pyrene	4.81 U	7.42	4.81	1	06/18/15 21:01	6/18/15	
Naphthalene	**24.5** J	7.42	6.77	1	06/18/15 21:01	6/18/15	
Pentachlorophenol (PCP)	**256**	74.2	32.8	1	06/18/15 21:01	6/18/15	
Phenanthrene	**33.0**	14.8	3.72	1	06/18/15 21:01	6/18/15	
Pyrene	**41.1**	7.42	4.37	1	06/18/15 21:01	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	93	34 - 166	06/18/15 21:01	
2-Fluorobiphenyl	58	30 - 118	06/18/15 21:01	
p-Terphenyl-d14	68	41 - 146	06/18/15 21:01	

KJ 6-30-15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 09:50
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-11	**Basis:**	Dry
Lab Code:	J1504770-018		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**3.52**	mg/Kg	0.90	0.21	1	06/18/15 20:23	06/17/15	
Chromium, Total Recoverable	6010B	**10.1** U	mg/Kg	0.90	0.04	1	06/18/15 20:23	06/17/15	
Copper, Total Recoverable	6010B	**4.97**	mg/Kg	0.90	0.11	1	06/18/15 20:23	06/17/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 09:50
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-11	**Basis:**	Dry
Lab Code:	J1504770-018		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**51500**	mg/Kg	2000	400	1	06/18/15 14:40	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 09:50
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-11	**Basis:**	As Received
Lab Code:	J1504770-018		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**49**	Percent	0.10	0.10	1	06/24/15 15:46	

KB 7-1-15

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Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:00
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-12	**Units:**	ug/Kg
Lab Code:	J1504770-019	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	5.97 U	7.51	5.97	1	06/18/15 21:25	6/18/15	
2-Methylnaphthalene	**6.36 J** J	7.51	5.08	1	06/18/15 21:25	6/18/15	
Acenaphthene	**33.2**	15.0	6.85	1	06/18/15 21:25	6/18/15	
Acenaphthylene	**5.31 J**	15.0	4.86	1	06/18/15 21:25	6/18/15	
Anthracene	**21.7**	7.51	3.54	1	06/18/15 21:25	6/18/15	
Benz(a)anthracene	4.20 U	7.51	4.20	1	06/18/15 21:25	6/18/15	
Benzo(a)pyrene	2.21 U	7.51	2.21	1	06/18/15 21:25	6/18/15	
Benzo(b)fluoranthene	4.42 U	7.51	4.42	1	06/18/15 21:25	6/18/15	
Benzo(g,h,i)perylene	4.86 U	7.51	4.86	1	06/18/15 21:25	6/18/15	
Benzo(k)fluoranthene	5.31 U	7.51	5.31	1	06/18/15 21:25	6/18/15	
Chrysene	**4.65 J**	7.51	4.20	1	06/18/15 21:25	6/18/15	
Dibenz(a,h)anthracene	**8.23**	7.51	5.97	1	06/18/15 21:25	6/18/15	
Fluoranthene	**68.2**	7.51	4.42	1	06/18/15 21:25	6/18/15	
Fluorene	**21.3**	7.51	4.86	1	06/18/15 21:25	6/18/15	
Indeno(1,2,3-cd)pyrene	**8.30**	7.51	4.86	1	06/18/15 21:25	6/18/15	
Naphthalene	**11.2** J	7.51	6.85	1	06/18/15 21:25	6/18/15	
Pentachlorophenol (PCP)	**258**	75.1	33.2	1	06/18/15 21:25	6/18/15	
Phenanthrene	**28.7**	15.0	3.76	1	06/18/15 21:25	6/18/15	
Pyrene	**43.4**	7.51	4.42	1	06/18/15 21:25	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	111	34 - 166	06/18/15 21:25	
2-Fluorobiphenyl	71	30 - 118	06/18/15 21:25	
p-Terphenyl-d14	74	41 - 146	06/18/15 21:25	

FAJ 6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:00
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-12	**Basis:**	Dry
Lab Code:	J1504770-019		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**3.36**	mg/Kg	0.86	0.20	1	06/18/15 20:36	06/17/15	
Chromium, Total Recoverable	6010B	**11.4**	mg/Kg	0.86	0.04	1	06/18/15 20:36	06/17/15	
Copper, Total Recoverable	6010B	**5.85**	mg/Kg	0.86	0.11	1	06/18/15 20:36	06/17/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:00
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-12	**Basis:**	Dry
Lab Code:	J1504770-019		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**63000**	mg/Kg	2100	400	1	06/18/15 14:47	

KF 7-1-15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 10:00
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-12	**Basis:**	As Received
Lab Code:	J1504770-019		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**48**	Percent	0.10	0.10	1	06/24/15 15:46	

KAJ 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 11:20
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SD-EB	**Basis:**	NA
Lab Code:	J1504770-020		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6020	0.5 U	ug/L	1.0	0.5	1	06/16/15 21:22	06/16/15	
Calcium, Total Recoverable	6010B	**0.12** U	mg/L	0.10	0.02	1	06/16/15 06:33	06/15/15	
Chromium, Total Recoverable	6020	**3.7**	ug/L	1.0	0.2	1	06/16/15 21:22	06/16/15	
Copper, Total Recoverable	6020	0.3 U	ug/L	1.0	0.3	1	06/16/15 21:22	06/16/15	
Hardness, Total as CaCO3	SM 2340 B	1.7 U	mg/L	1.7	-	1	NA	NA	
Magnesium, Total Recoverable	6010B	**0.02 J**	mg/L	0.10	0.02	1	06/16/15 06:33	06/15/15	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 11:20
Sample Matrix:	Water	**Date Received:**	06/11/15 10:00
Sample Name:	SD-EB	**Basis:**	NA
Lab Code:	J1504770-020		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060	1.0 ~~0.5 J~~ U	mg/L	1.0	0.09	1	06/19/15 20:43	

KQ 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-6	**Units:**	ug/Kg
Lab Code:	J1504770-021	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	2.92 U	3.67	2.92	1	06/18/15 21:49	6/18/15	
2-Methylnaphthalene	2.49 U	3.67	2.49	1	06/18/15 21:49	6/18/15	
Acenaphthene	3.35 U	7.34	3.35	1	06/18/15 21:49	6/18/15	
Acenaphthylene	2.38 U	7.34	2.38	1	06/18/15 21:49	6/18/15	
Anthracene	**4.29**	3.67	1.73	1	06/18/15 21:49	6/18/15	
Benz(a)anthracene	2.06 U	3.67	2.06	1	06/18/15 21:49	6/18/15	
Benzo(a)pyrene	1.08 U	3.67	1.08	1	06/18/15 21:49	6/18/15	
Benzo(b)fluoranthene	**22.4**	3.67	2.16	1	06/18/15 21:49	6/18/15	
Benzo(g,h,i)perylene	**3.06 J**	3.67	2.38	1	06/18/15 21:49	6/18/15	
Benzo(k)fluoranthene	**9.75**	3.67	2.60	1	06/18/15 21:49	6/18/15	
Chrysene	**6.00**	3.67	2.06	1	06/18/15 21:49	6/18/15	
Dibenz(a,h)anthracene	2.92 U	3.67	2.92	1	06/18/15 21:49	6/18/15	
Fluoranthene	**14.1**	3.67	2.16	1	06/18/15 21:49	6/18/15	
Fluorene	2.38 U	3.67	2.38	1	06/18/15 21:49	6/18/15	
Indeno(1,2,3-cd)pyrene	**3.54 J**	3.67	2.38	1	06/18/15 21:49	6/18/15	
Naphthalene	3.35 U	3.67	3.35	1	06/18/15 21:49	6/18/15	
Pentachlorophenol (PCP)	**239**	36.7	16.2	1	06/18/15 21:49	6/18/15	
Phenanthrene	1.84 U	7.34	1.84	1	06/18/15 21:49	6/18/15	
Pyrene	**12.6**	3.67	2.16	1	06/18/15 21:49	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	101	34 - 166	06/18/15 21:49	
2-Fluorobiphenyl	59	30 - 118	06/18/15 21:49	
p-Terphenyl-d14	64	41 - 146	06/18/15 21:49	

KPD 6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-6	**Basis:**	Dry
Lab Code:	J1504770-021		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**5.46**	mg/Kg	0.44	0.12	1	06/18/15 20:40	06/17/15	
Chromium, Total Recoverable	6010B	**26.5**	mg/Kg	0.44	0.02	1	06/18/15 20:40	06/17/15	
Copper, Total Recoverable	6010B	**3.64**	mg/Kg	0.44	0.07	1	06/18/15 20:40	06/17/15	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-6	**Basis:**	Dry
Lab Code:	J1504770-021		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**710**	mg/Kg	510	100	1	06/18/15 15:02	

KJ 7-1-15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-6	**Basis:**	As Received
Lab Code:	J1504770-021		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**88**	Percent	0.10	0.10	1	06/24/15 15:46	

KAD 7-1-15

Client:	EarthCon Site Services Inc		
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Service Request:**	J1504770
Sample Matrix:	Sediment	**Date Collected:**	06/09/15 13:55
		Date Received:	06/11/15 10:00
Sample Name:	SD-5		
Lab Code:	J1504770-022	**Units:**	ug/Kg
		Basis:	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	5.77 U	7.26	5.77	1	06/18/15 22:13	6/18/15	
2-Methylnaphthalene	**7.99**	7.26	4.91	1	06/18/15 22:13	6/18/15	
Acenaphthene	6.62 U	14.5	6.62	1	06/18/15 22:13	6/18/15	
Acenaphthylene	**25.0**	14.5	4.70	1	06/18/15 22:13	6/18/15	
Anthracene	**66.8**	7.26	3.42	1	06/18/15 22:13	6/18/15	
Benz(a)anthracene	4.06 U	7.26	4.06	1	06/18/15 22:13	6/18/15	
Benzo(a)pyrene	**31.7**	7.26	2.14	1	06/18/15 22:13	6/18/15	
Benzo(b)fluoranthene	**71.3**	7.26	4.27	1	06/18/15 22:13	6/18/15	
Benzo(g,h,i)perylene	**20.6**	7.26	4.70	1	06/18/15 22:13	6/18/15	
Benzo(k)fluoranthene	**24.8**	7.26	5.13	1	06/18/15 22:13	6/18/15	
Chrysene	4.06 U	7.26	4.06	1	06/18/15 22:13	6/18/15	
Dibenz(a,h)anthracene	5.77 U	7.26	5.77	1	06/18/15 22:13	6/18/15	
Fluoranthene	**52.3**	7.26	4.27	1	06/18/15 22:13	6/18/15	
Fluorene	**10.8**	7.26	4.70	1	06/18/15 22:13	6/18/15	
Indeno(1,2,3-cd)pyrene	**20.3**	7.26	4.70	1	06/18/15 22:13	6/18/15	
Naphthalene	**26.8**	7.26	6.62	1	06/18/15 22:13	6/18/15	
Pentachlorophenol (PCP)	**1950**	72.6	32.1	1	06/18/15 22:13	6/18/15	
Phenanthrene	**23.0**	14.5	3.63	1	06/18/15 22:13	6/18/15	
Pyrene	**61.6**	7.26	4.27	1	06/18/15 22:13	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	91	34 - 166	06/18/15 22:13	
2-Fluorobiphenyl	50	30 - 118	06/18/15 22:13	
p-Terphenyl-d14	52	41 - 146	06/18/15 22:13	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:55
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-5	**Basis:**	Dry
Lab Code:	J1504770-022		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**18.8**	mg/Kg	0.92	0.22	1	06/18/15 20:48	06/17/15	
Chromium, Total Recoverable	6010B	**56.9**	mg/Kg	0.92	0.04	1	06/18/15 20:48	06/17/15	
Copper, Total Recoverable	6010B	**33.2** J	mg/Kg	0.92	0.12	1	06/18/15 20:48	06/17/15	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 13:55
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-5	**Basis:**	Dry
Lab Code:	J1504770-022		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**27700**	mg/Kg	1700	400	1	06/18/15 15:09	

KD 7-1-15

Client: EarthCon Site Services Inc
Project: IP Wiggins Church House Branch CMS/02.20020008.15
Sample Matrix: Sediment

Service Request: J1504770
Date Collected: 06/09/15 13:55
Date Received: 06/11/15 10:00

Sample Name: SD-5
Lab Code: J1504770-022

Basis: As Received

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	49	Percent	0.10	0.10	1	06/24/15 15:46	

6/27/15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 14:15
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-4	**Units:**	ug/Kg
Lab Code:	J1504770-023	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.34 U	4.20	3.34	1	06/19/15 13:00	6/18/15	
2-Methylnaphthalene	2.85 U	4.20	2.85	1	06/19/15 13:00	6/18/15	
Acenaphthene	3.84 U	8.40	3.84	1	06/19/15 13:00	6/18/15	
Acenaphthylene	2.72 U	8.40	2.72	1	06/19/15 13:00	6/18/15	
Anthracene	1.98 U	4.20	1.98	1	06/19/15 13:00	6/18/15	
Benz(a)anthracene	**3.37 J**	4.20	2.35	1	06/19/15 13:00	6/18/15	
Benzo(a)pyrene	1.24 U	4.20	1.24	1	06/19/15 13:00	6/18/15	
Benzo(b)fluoranthene	2.48 U	4.20	2.48	1	06/19/15 13:00	6/18/15	
Benzo(g,h,i)perylene	2.72 U	4.20	2.72	1	06/19/15 13:00	6/18/15	
Benzo(k)fluoranthene	2.97 U	4.20	2.97	1	06/19/15 13:00	6/18/15	
Chrysene	2.35 U	4.20	2.35	1	06/19/15 13:00	6/18/15	
Dibenz(a,h)anthracene	3.34 U	4.20	3.34	1	06/19/15 13:00	6/18/15	
Fluoranthene	2.48 U	4.20	2.48	1	06/19/15 13:00	6/18/15	
Fluorene	2.72 U	4.20	2.72	1	06/19/15 13:00	6/18/15	
Indeno(1,2,3-cd)pyrene	2.72 U	4.20	2.72	1	06/19/15 13:00	6/18/15	
Naphthalene	3.84 U	4.20	3.84	1	06/19/15 13:00	6/18/15	
Pentachlorophenol (PCP)	**52.7**	42.0	18.6	1	06/19/15 13:00	6/18/15	
Phenanthrene	2.11 U	8.40	2.11	1	06/19/15 13:00	6/18/15	
Pyrene	2.48 U	4.20	2.48	1	06/19/15 13:00	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	68	34 - 166	06/19/15 13:00	
2-Fluorobiphenyl	60	30 - 118	06/19/15 13:00	
p-Terphenyl-d14	63	41 - 146	06/19/15 13:00	

KJD 6-30-15

Client: EarthCon Site Services Inc
Project: IP Wiggins Church House Branch CMS/02.20020008.15
Sample Matrix: Sediment

Service Request: J1504770
Date Collected: 06/09/15 14:15
Date Received: 06/11/15 10:00

Sample Name: SD-4
Lab Code: J1504770-023

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**1.76**	mg/Kg	0.45	0.12	1	06/18/15 21:17	06/17/15	
Chromium, Total Recoverable	6010B	**3.47**	mg/Kg	0.45	0.02	1	06/18/15 21:17	06/17/15	
Copper, Total Recoverable	6010B	**0.99**	mg/Kg	0.45	0.07	1	06/18/15 21:17	06/17/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 14:15
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-4	**Basis:**	Dry
Lab Code:	J1504770-023		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**350 J**	mg/Kg	550	100	1	06/19/15 10:03	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 14:15
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-4	**Basis:**	As Received
Lab Code:	J1504770-023		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**84**	Percent	0.10	0.10	1	06/24/15 15:46	

6/26/15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-3	**Units:**	ug/Kg
Lab Code:	J1504770-024	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	7.22 U	9.09	7.22	1	06/19/15 13:24	6/18/15	
2-Methylnaphthalene	6.15 U	9.09	6.15	1	06/19/15 13:24	6/18/15	
Acenaphthene	8.29 U	18.2	8.29	1	06/19/15 13:24	6/18/15	
Acenaphthylene	**39.0**	18.2	5.88	1	06/19/15 13:24	6/18/15	
Anthracene	**131**	9.09	4.28	1	06/19/15 13:24	6/18/15	
Benz(a)anthracene	**41.4**	9.09	5.08	1	06/19/15 13:24	6/18/15	
Benzo(a)pyrene	**60.7**	9.09	2.68	1	06/19/15 13:24	6/18/15	
Benzo(b)fluoranthene	**153**	9.09	5.35	1	06/19/15 13:24	6/18/15	
Benzo(g,h,i)perylene	**50.5**	9.09	5.88	1	06/19/15 13:24	6/18/15	
Benzo(k)fluoranthene	**49.8**	9.09	6.42	1	06/19/15 13:24	6/18/15	
Chrysene	**67.2**	9.09	5.08	1	06/19/15 13:24	6/18/15	
Dibenz(a,h)anthracene	**13.1**	9.09	7.22	1	06/19/15 13:24	6/18/15	
Fluoranthene	**76.4**	9.09	5.35	1	06/19/15 13:24	6/18/15	
Fluorene	**12.4**	9.09	5.88	1	06/19/15 13:24	6/18/15	
Indeno(1,2,3-cd)pyrene	**51.8**	9.09	5.88	1	06/19/15 13:24	6/18/15	
Naphthalene	**16.8**	9.09	8.29	1	06/19/15 13:24	6/18/15	
Pentachlorophenol (PCP)	**1680**	90.9	40.1	1	06/19/15 13:24	6/18/15	
Phenanthrene	**18.5**	18.2	4.55	1	06/19/15 13:24	6/18/15	
Pyrene	**102**	9.09	5.35	1	06/19/15 13:24	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	92	34 - 166	06/19/15 13:24	
2-Fluorobiphenyl	68	30 - 118	06/19/15 13:24	
p-Terphenyl-d14	69	41 - 146	06/19/15 13:24	

6.30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-3	**Basis:**	Dry
Lab Code:	J1504770-024		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**13.5**	mg/Kg	1.1	0.3	1	06/18/15 21:21	06/17/15	
Chromium, Total Recoverable	6010B	**56.2**	mg/Kg	1.1	0.05	1	06/18/15 21:21	06/17/15	
Copper, Total Recoverable	6010B	**42.9**	mg/Kg	1.1	0.2	1	06/18/15 21:21	06/17/15	

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-3	**Basis:**	Dry
Lab Code:	J1504770-024		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**39600**	mg/Kg	2300	500	1	06/19/15 10:13	

KJD 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:35
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-3	**Basis:**	As Received
Lab Code:	J1504770-024		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	**38**	Percent	0.10	0.10	1	06/24/15 15:46	

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:45
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-2	**Units:**	ug/Kg
Lab Code:	J1504770-025	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	3.32 U	4.18	3.32	1	06/19/15 13:49	6/18/15	
2-Methylnaphthalene	2.83 U	4.18	2.83	1	06/19/15 13:49	6/18/15	
Acenaphthene	**89.1**	8.35	3.81	1	06/19/15 13:49	6/18/15	
Acenaphthylene	**26.5**	8.35	2.71	1	06/19/15 13:49	6/18/15	
Anthracene	**185**	4.18	1.97	1	06/19/15 13:49	6/18/15	
Benz(a)anthracene	**175**	4.18	2.34	1	06/19/15 13:49	6/18/15	
Benzo(a)pyrene	**65.5**	4.18	1.23	1	06/19/15 13:49	6/18/15	
Benzo(b)fluoranthene	**155**	4.18	2.46	1	06/19/15 13:49	6/18/15	
Benzo(g,h,i)perylene	**26.6**	4.18	2.71	1	06/19/15 13:49	6/18/15	
Benzo(k)fluoranthene	**55.9**	4.18	2.95	1	06/19/15 13:49	6/18/15	
Chrysene	**153**	4.18	2.34	1	06/19/15 13:49	6/18/15	
Dibenz(a,h)anthracene	**8.11**	4.18	3.32	1	06/19/15 13:49	6/18/15	
Fluoranthene	**895**	41.8	24.6	10	06/24/15 19:48	6/18/15	
Fluorene	**55.0**	4.18	2.71	1	06/19/15 13:49	6/18/15	
Indeno(1,2,3-cd)pyrene	**28.4**	4.18	2.71	1	06/19/15 13:49	6/18/15	
Naphthalene	3.81 U	4.18	3.81	1	06/19/15 13:49	6/18/15	
Pentachlorophenol (PCP)	**361**	41.8	18.5	1	06/19/15 13:49	6/18/15	
Phenanthrene	**110**	8.35	2.09	1	06/19/15 13:49	6/18/15	
Pyrene	**616**	41.8	24.6	10	06/24/15 19:48	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	86	34 - 166	06/19/15 13:49	
2-Fluorobiphenyl	67	30 - 118	06/19/15 13:49	
p-Terphenyl-d14	71	41 - 146	06/19/15 13:49	

6.30.15

Client: EarthCon Site Services Inc
Project: IP Wiggins Church House Branch CMS/02.20020008.15
Sample Matrix: Sediment

Service Request: J1504770
Date Collected: 06/09/15 17:45
Date Received: 06/11/15 10:00

Sample Name: SD-2
Lab Code: J1504770-025

Basis: Dry

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**2.13**	mg/Kg	0.51	0.12	1	06/18/15 21:25	06/17/15	
Chromium, Total Recoverable	6010B	**7.86**	mg/Kg	0.51	0.02	1	06/18/15 21:25	06/17/15	
Copper, Total Recoverable	6010B	**6.65**	mg/Kg	0.51	0.07	1	06/18/15 21:25	06/17/15	

6/30.15

Analytical Report

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:45
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-2	**Basis:**	Dry
Lab Code:	J1504770-025		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**1970**	mg/Kg	650	120	1	06/19/15 10:23	

KBJ 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:45
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-2	**Basis:**	As Received
Lab Code:	J1504770-025		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	77	Percent	0.10	0.10	1	06/24/15 15:46	

KPS 7-1-15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:55
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-1	**Units:**	ug/Kg
Lab Code:	J1504770-026	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS SIM

Analysis Method: 8270C SIM
Prep Method: EPA 3546

Analyte Name	Result	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
1-Methylnaphthalene	4.58 U	5.76	4.58	1	06/19/15 14:13	6/18/15	
2-Methylnaphthalene	3.90 U	5.76	3.90	1	06/19/15 14:13	6/18/15	
Acenaphthene	5.25 U	11.5	5.25	1	06/19/15 14:13	6/18/15	
Acenaphthylene	3.73 U	11.5	3.73	1	06/19/15 14:13	6/18/15	
Anthracene	2.71 U	5.76	2.71	1	06/19/15 14:13	6/18/15	
Benz(a)anthracene	**4.77 J**	5.76	3.22	1	06/19/15 14:13	6/18/15	
Benzo(a)pyrene	**14.8**	5.76	1.70	1	06/19/15 14:13	6/18/15	
Benzo(b)fluoranthene	3.39 U	5.76	3.39	1	06/19/15 14:13	6/18/15	
Benzo(g,h,i)perylene	3.73 U	5.76	3.73	1	06/19/15 14:13	6/18/15	
Benzo(k)fluoranthene	4.07 U	5.76	4.07	1	06/19/15 14:13	6/18/15	
Chrysene	3.22 U	5.76	3.22	1	06/19/15 14:13	6/18/15	
Dibenz(a,h)anthracene	4.58 U	5.76	4.58	1	06/19/15 14:13	6/18/15	
Fluoranthene	3.39 U	5.76	3.39	1	06/19/15 14:13	6/18/15	
Fluorene	3.73 U	5.76	3.73	1	06/19/15 14:13	6/18/15	
Indeno(1,2,3-cd)pyrene	3.73 U	5.76	3.73	1	06/19/15 14:13	6/18/15	
Naphthalene	5.25 U	5.76	5.25	1	06/19/15 14:13	6/18/15	
Pentachlorophenol (PCP)	**63.6**	57.6	25.5	1	06/19/15 14:13	6/18/15	
Phenanthrene	2.88 U	11.5	2.88	1	06/19/15 14:13	6/18/15	
Pyrene	3.39 U	5.76	3.39	1	06/19/15 14:13	6/18/15	

Surrogate Name	% Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	69	34 - 166	06/19/15 14:13	
2-Fluorobiphenyl	70	30 - 118	06/19/15 14:13	
p-Terphenyl-d14	56	41 - 146	06/19/15 14:13	

KJ 6 30.15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:55
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-1	**Basis:**	Dry
Lab Code:	J1504770-026		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Date Extracted	Q
Arsenic, Total Recoverable	6010B	**5.25**	mg/Kg	0.72	0.17	1	06/18/15 21:38	06/17/15	
Chromium, Total Recoverable	6010B	**18.2**	mg/Kg	0.72	0.03	1	06/18/15 21:38	06/17/15	
Copper, Total Recoverable	6010B	**8.84**	mg/Kg	0.72	0.09	1	06/18/15 21:38	06/17/15	

6·30·15

Client:	EarthCon Site Services Inc	**Service Request:**	J1504770
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Date Collected:**	06/09/15 17:55
Sample Matrix:	Sediment	**Date Received:**	06/11/15 10:00
Sample Name:	SD-1	**Basis:**	Dry
Lab Code:	J1504770-026		

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Carbon, Total Organic (TOC)	9060M	**19200**	mg/Kg	1400	300	1	06/19/15 10:38	

KBJ 7-1-15

Analytical Report

Client:	EarthCon Site Services Inc		
Project:	IP Wiggins Church House Branch CMS/02.20020008.15	**Service Request:**	J1504770
Sample Matrix:	Sediment	**Date Collected:**	06/09/15 17:55
		Date Received:	06/11/15 10:00
Sample Name:	SD-1		
Lab Code:	J1504770-026	**Basis:**	As Received

General Chemistry Parameters

Analyte Name	Analysis Method	Result	Units	PQL	MDL	Dil.	Date Analyzed	Q
Solids, Total	160.3 Modified	61	Percent	0.10	0.10	1	06/24/15 15:46	

KEH 7-1.15

June 26, 2015

Client: EarthCon Consultants Inc
411A Highland Ave. #377
Somerville, MA 02144
Attn: Doug Seely
Project: IP Wiggins Church House Branch CMS
ALS # J1504770

Date Received: 6/11/15

Certificate of Analysis

Sample ID:	Sample Date:	Lab #:	Particle Size D422 wt%					

See pages 2-5

Notes:
Samples were air dried prior to analysis.

Digitally signed by wendy.hyatt@alsglobal.com
Date: 2015.06.26 08:26:36 -07'00'

Wendy Hyatt, Client Services Manager

ALS Environmental - Tucson, AZ

Particle Size Analysis by Sieving

ASTM D422

Client: ALS JAX

Project: J1504770

Analyst: RC

Analysis Date: 6/22/2015

Analyst Review: RC 6/23/15

Supervisor Review: WH 6/25/15

	Lab No.		J1504770-011		Lab No.				Lab No.				Lab No.			
	Sample ID		Soil 5		Sample ID				Sample ID				Sample ID			
Starting Sample	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %
	315.1	491.0	175.9	99.8												
Screen Sizes	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing
	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%
3/4"	563.3	563.3	0.00	100.00												
3/8"	487.1	488.1	0.57	99.43												
4	469.2	472.7	1.99	97.44												
10	405.0	424.0	10.82	86.62												
20	372.7	401.3	16.29	70.33												
40	344.1	377.7	19.13	51.20												
60	304.7	353.8	27.96	23.23												
140	302.4	332.2	16.97	6.26												
200	288.2	292.2	2.28	3.99												
PAN	319.6	326.6	3.99	0.00												
	Finish Wt. g	175.6	100.0		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00	

Remarks

ALS Environmental - Tucson, AZ

Particle Size Analysis by Sieving

ASTM D422

Client: ALS JAX

Project: J1504770

Analyst: RC

Analysis Date: 6/22/2015

Analyst Review: RC 6/23/15

Supervisor Review: WH 6/25/15

	Lab No.		J1504770-016		Lab No.				Lab No.				Lab No.			
	Sample ID		Soil 1		Sample ID				Sample ID				Sample ID			
Starting Sample	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %
	314.9	479.1	164.2	100.0												
Screen Sizes	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing
	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%
1"	554.1	554.1	0.00	100.00												
3/4"	563.3	563.3	0.00	100.00												
3/8"	487.1	487.3	0.12	99.88												
4	469.2	470.7	0.91	98.96												
10	405.0	405.9	0.55	98.42												
20	372.7	374.8	1.28	97.14												
40	344.1	358.5	8.77	88.37												
60	304.8	372.9	41.47	46.89												
140	302.4	374.5	43.91	2.98												
200	288.1	290.4	1.40	1.58												
PAN	319.6	322.2	1.58	0.00												
	Finish Wt. g	164.2	100.0		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00	

Remarks

ALS Environmental - Tucson, AZ

Particle Size Analysis by Sieving

ASTM D422

Client: ALS JAX

Project: J1504770

Analyst: RC

Analysis Date: PREP 6/22/15;SEP 6/23/15

Analyst Review: RC 6/23/15

Supervisor Review: WH 6/25/15

	Lab No.		J1504770-018		Lab No.				Lab No.				Lab No.			
	Sample ID		SD-11		Sample ID				Sample ID				Sample ID			
Starting Sample	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %
	105.18	200.71	95.53	100.00												
Screen Sizes	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing
	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%
3/8"	103.06	103.06	0.00	100.00												
4	104.74	104.90	0.17	99.83												
10	104.60	105.25	0.68	99.15												
20	104.50	107.53	3.17	95.98												
40	103.97	109.53	5.82	90.16												
60	101.23	111.11	10.34	79.82												
140	101.59	127.18	26.79	53.03												
200	103.19	106.65	3.62	49.41												
Pan	0.0	47.2	49.41	0.00												
	Finish Wt. g	95.53	100.0		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00	

Remarks: Wet sieve analysis was performed do to cementation of sediment particle. 125mL OF 4% SODIUM HEXAMETAPHOSPHATE solution was used as a dispersing agent. Sample and dispersing agent were allowed to soak for overnight (16hrs). The slurry solution and deionized rinse water were blended at 10,000RPM for one minute prior to sieving.

ALS Environmental - Tucson, AZ

Particle Size Analysis by Sieving

ASTM D422

Client: ALS JAX

Project: J1504770

Analyst: RC/KS

Analysis Date: 6/22/15;6/23/15

Analyst Review: RC 6/23/15

Supervisor Review: WH 6/25/15

	Lab No.		J1504770-021		Lab No.				Lab No.				Lab No.			
	Sample ID		SD-6		Sample ID				Sample ID				Sample ID			
Starting Sample	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %	Container Wt. g	Sx & Cont Wt. g	Begin. Sx Wt. g	Recovery %
	314.8	534.5	219.7	100.0												
Screen Sizes	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing	Container Wt.	Sample + Cont. Wt.	Retained	Passing
	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%	g	g	wt%	wt%
3/8"	487.1	506.4	8.79	91.21												
4	469.1	491.3	10.11	81.10												
10	405.0	452.4	21.58	59.52												
20	372.8	406.9	15.53	43.99												
40	344.1	408.6	29.37	14.62												
60	304.7	332.1	12.48	2.14												
140	302.4	306.7	1.96	0.18												
200	288.1	288.3	0.09	0.09												
PAN	319.6	319.8	0.09	0.00												
	Finish Wt. g	219.6	100.0		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00		Finish Wt. g	0.0	0.00	

Remarks